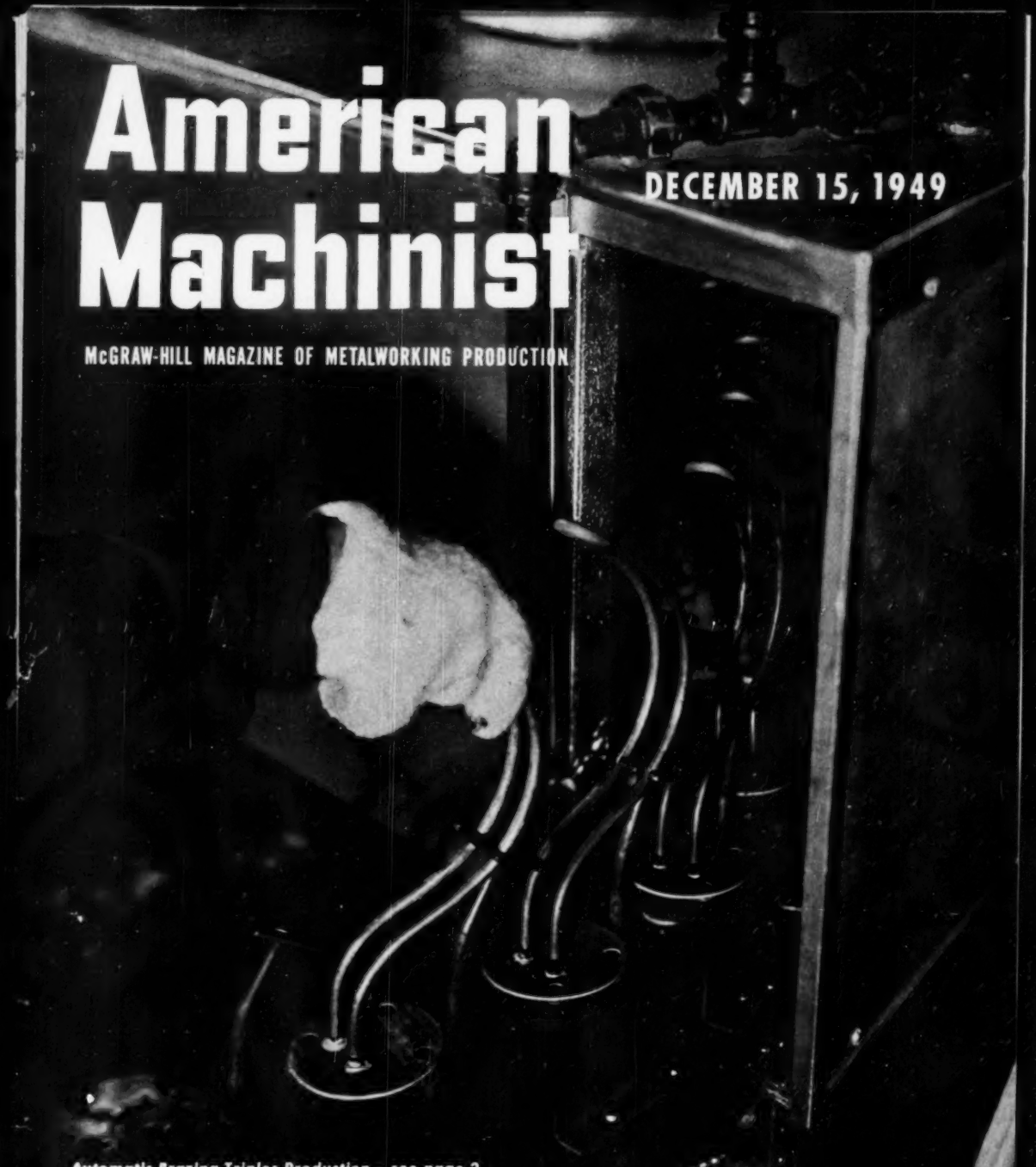
American Machinist

DECEMBER 15, 1949

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

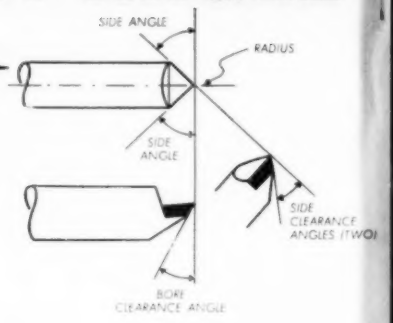


Automatic Brazing Triples Production—see page 2

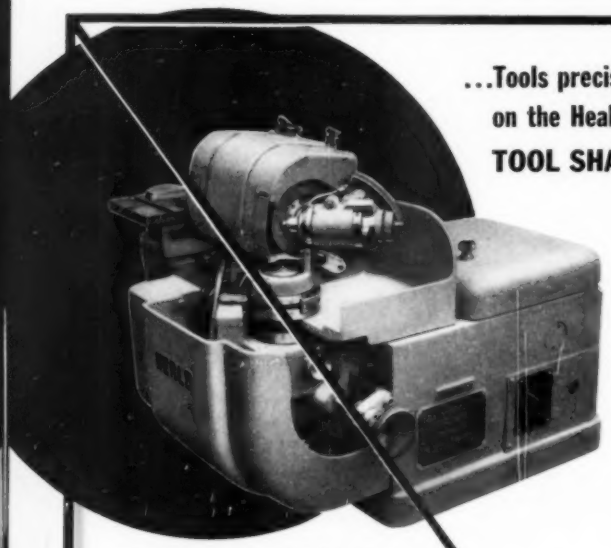
Resistance Welding Fixture Design

Material Layout for Economical Blanking

BETTER FROM ANY ANGLE



...Tools precision lapped on the Heald Model 2 TOOL SHARPENER



Above, the new Heald Model 2 Tool Sharpener which precision laps five angles and a radius in a single setting automatically.

- **Longer tool life**
- **More accurate cutting edge**
- **Greater precision, more production from your Heald Bore-Matics**

As shown in the tool sketch above, five angles and the tool radius are diamond lapped to microscopic precision at a single setting of the Heald Model 2 Tool Sharpening Machine. The operation is fully automatic. The operator sets the desired angles on graduated scales, inserts the tool in the holder, and the machine does the rest — with an accuracy which cannot be duplicated by hand grinding.

Tests have proved that correctly lapped tools last from two to four times as long as hand ground edges. What's more, proper sharpening of cemented carbide and diamond tools is an important factor in the ultimate success of any precision borizing operation.

FOR EXAMPLE:

This tool sharpener helped one manufacturer MULTIPLY PRODUCTION FIVE TIMES with a New Heald Model 222 Bore-Matic

A manufacturer of textile machinery formerly processed cast iron parts in three separate operations. Accuracy was not high, and many parts had to be reworked. But now these same parts are completely borized in two settings on a single Heald Model 222 Bore-Matic. A completed piece now comes off the machine every cycle — five times faster than was possible by previous methods. The cycle is continuous, and parts for the left-hand station are loaded while work on the right-hand station is being borized, and vice versa.

This great increase in production is due to many factors — including the higher speed and efficiency of the machine, the improved loading and clamping fixtures, and last (but not least) the fact that the cutting tools are precision lapped on a Heald Model 2 Tool Sharpening Machine.

THE HEALD MACHINE COMPANY
Worcester 6, Mass.
Branch Offices in Chicago • Cleveland • Dayton
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HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Chips and Quips

Our Cover . . . A continuous automatic brazing machine, for joining water-heater copper tubes to brass mounting plates, has stepped up production of assemblies at the Mansfield Works of Westinghouse Electric Corp. One operator now brazes 120 elements per hr, as compared with 45 per hr by hand brazing.

The $1800 machine has a 48-in. dia rotary table carrying 24 fixtures at 6 to 30 ipm through a natural-gas heating compartment. Pictured in our cover Kodachrome, the setup is also described in an article in this issue by Fred Gandert, welding engineer.

Optics . . . For a couple of years, we've thought it would prove interesting to put together a Special Report on the uses of optical equipment in the shop. Now Assistant Editor Emerson has done it, after visits to a number of makers and users. Here is a detailed description of optical flats and how to use them, plus descriptions of various kinds of optical aids—for enlargement, for straightness or for comparison.

Remember? . . . As we approach the turn of the century, Fred Colvin, Editor Emeritus, dips into his memories and his files to give us some pictures of ancient machine tools. Some are long since honorable scrap, but some machines only a little younger are still working—and shouldn't be.

Merry Christmas . . . We of the staff of *American Machinist*, in this last issue before the holidays, want to take this occasion to wish you a really Merry Christmas.

Psychiatry . . . Fashionable magazines frequently mention psychiatry these days, and even more frequently carry cartoons about this branch of medicine . . . Believing as always that what people laugh at they secretly believe in, we've done some investigating, bring you herewith a story on the application of psychiatry to industry and how it can be applied in avoiding mental explosions that cause physical troubles.

Handling . . . Howard Breitzman, maintenance supervisor at Chain Belt Co., Milwaukee, describes development of inclined scraper conveyors to remove scrap from press pits. Rapid disposal of both work and scrap permits attainment of full production potential in punch-press operations.

Apprentices . . . Because we believe apprenticeship is a vitally needed and presently neglected part of Metalworking, we've been trying to give you procedures and advantages in a series of articles. It seemed only fitting and proper to include a description of the far-famed Brown & Sharpe system, so Associate Editor Ashburn has written it up. By fortunate coincidence, B & S began training apprentices 100 years ago, so this also becomes a centiversary bow to an effective long-term program.

Coming . . . To close out the year, *A.M.* for Dec. 29 will feature a 16-page Special Report on How to Dress Grinding Wheels, by Associate Editor Miles Rowan. There'll also be articles on the new Caterpillar diesel plant, ultra-speed machining, shaving dies, automatic hard facing, welding a broach body, and on the history of chucks.

Resistance Fixtures . . . Readers reiterate, "Give us fundamentals, rules of procedure, alternate methods!" We do it in this issue with a list of 13 rules for designing resistance-welding fixtures, prepared in cooperation with the Resistance Welding Institute.

Grinding & Lapping . . . Two stories on radically different subjects come to you from the same plant. John C. Hanna, vice-president, Hanna Engineering Works, describes conversion of a Besly disk grinder to face-mill small parts to high finish, avoiding pre-lap grinding. Then B. M. Peterson, methods engineer, describes applications of hand lapping there and just how job-lot lapping to optical flatness is attained.

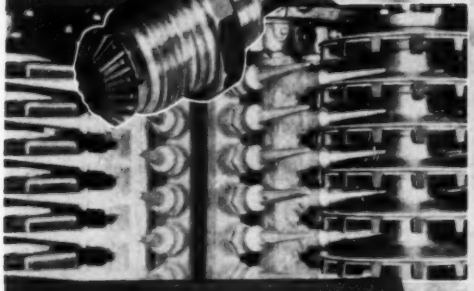
We usually advocate the new and the modern, but feel we should occasionally remind both ourselves and you that there are places where traditional methods still do the trick.

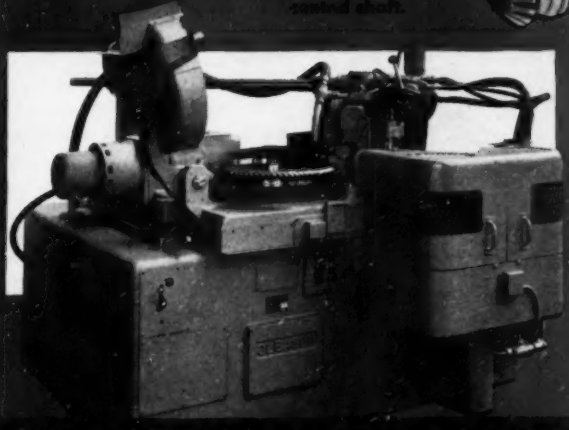
ANTI-GREELEY . . . Born 57 years ago in Helena, Mont., John C. Hanna denied Horace Greeley by coming east to Evanston, Ill., to school—and staying east thereafter. He served his apprenticeship at Hanna Engrg. Works, which his father founded, and worked through the shop and the engineering department, progressing up to general foreman, works engineer, and finally chief engineer, a position he attained in 1921. Since 1940 he has also been vice president. He and Pres. Arthur F. Jansen have been with Hanna for 43 years.

In contrast to many self-educated men, Mr. Hanna did not neglect the theoretical side. During his apprenticeship, he had two years of cooperative work with the Lewis Institute (now Ill. Institute of Technology) in the first class of 1911, and later tutored for four years with Prof. Alexander Moseley, former dean of engineering there. Mr. Hanna authors our current article on disk grinding, is a member of the ASME and Chicago Engineers Club.

GLEASON BEVEL GEARS

HELP PICK COTTON





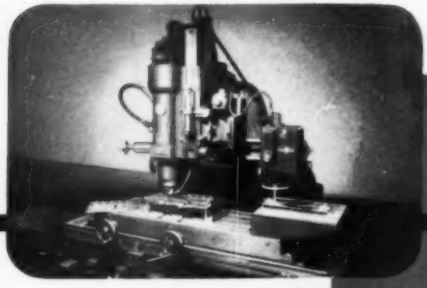
To produce the quantity of gears required, the Gleason No. 6 Straight Bevel Revacycle Machine with automatic loading was used, operating at 90% efficiency.

Bevel gears transmit power smoothly and quieter with greater durability. Have you investigated using bevels in your design?

GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

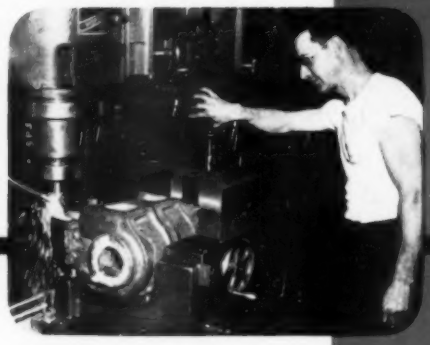
Builders of Bevel Gear Machinery for Over Eighty Years

Translated into shop language, the hieroglyphics at the left mean low cost automatic profile milling by CINCINNATI 28" Vertical Hydro-Tel. They represent actual milled surfaces, the outlines of which are controlled automatically through Cincinnati's exclusive 360° Automatic Profiling Unit.



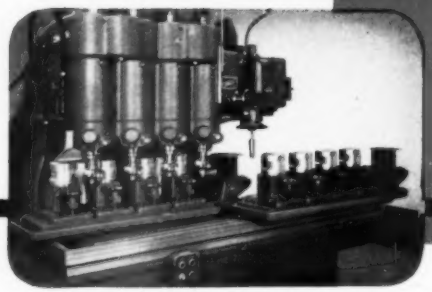
One of the four milling operations on bronze driving box liners. This 28" Vertical Hydro-Tel with 360° Automatic Profiling Unit replaced two other machines; saved over $1.40 per piece.

The first symbol belongs to the top illustration. In four operations on this 28" Vertical Hydro-Tel, the top and bottom of bronze driving box liners are milled, then the edge is milled in one continuous cut, and finally two sets of oil grooves are milled.



Milling the 180° arc on a large steel casting. This setup is indicative of Hydro-Tel's rugged construction—the cut is about 4½" wide.

The second hieroglyphic, like half of a barrel hoop, shows the shape of the milled surface in the center illustration. The operator merely guides the tracer finger into contact with the master template, and then the automatic profile milling unit takes over and accurately mills the contour.



Four heads and two fixtures more than quadruple the production obtainable with a single spindle machine. Production, 65 per hour. Like the other 28" Vertical Hydro-Tels illustrated here, this one is also equipped for 360° automatic profile milling. Two, three and four spindle heads are available.

High production automatic profile milling is the keynote in the third illustration. This 28" Vertical Hydro-Tel Miller has a four-spindle head which enables it to profile mill the pin section of four pistons at one time, both ends in one setting, like parentheses. While the milling operation proceeds, a second fixture can be reloaded.

CINCINNATI 28" Vertical Hydro-Tel Milling Machines may be equipped for three basic types of work: 1) General-purpose milling. 2) Automatic depth milling (die-sinking). 3) Automatic 360° profile milling. Types 2 and 3 can be combined. These machines have a wide range of application for shops of almost any productive capacity, from toolroom milling to high production single purpose work. Complete data may be obtained by writing for catalog M-1284-3. Brief specifications in Sweet's Catalog File for Mechanical Industries.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
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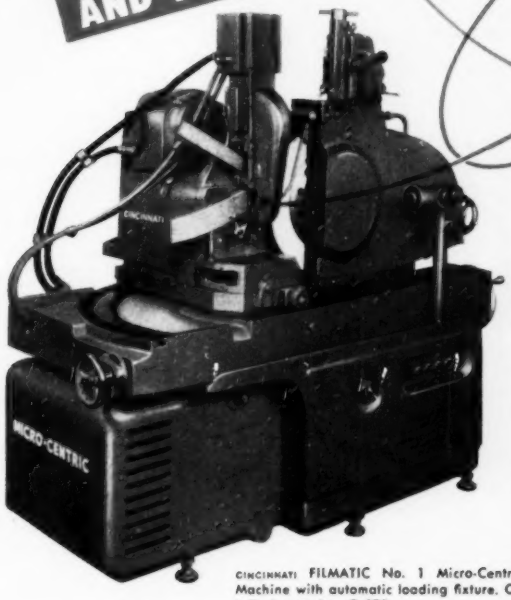
NEW MICRO-CENTRIC GRINDER

Replaces Two Machines of a Different Type

AND PRODUCES 75% MORE



CINCINNATI FILMATIC No. 1 Micro-Centric Grinding Machine with automatic loading fixture. Complete details in catalog G-573.

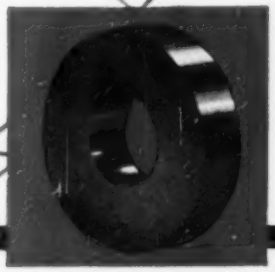
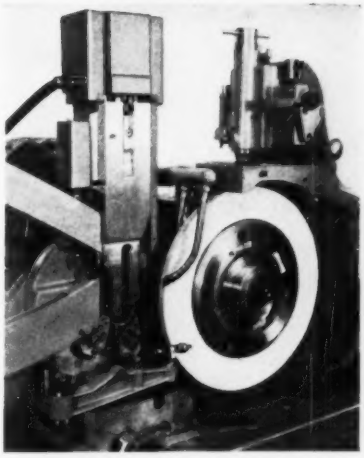


Photo of part ground on the machine at the left.

Part name	roll
Material	steel
Operation	grind diam. square with end
Accuracy obtained	diameter ±.00005" roundness .000015" squareness .000015"
Production	220 per hour

In the plant of a prominent manufacturer of household refrigerators, a new CINCINNATI FILMATIC Micro-Centric Grinder replaced two machines of a different type . . . produced more parts per hour within closer tolerances than specified . . . practically eliminated scrap. ¶ These revolutionary precision grinding machines incorporate a new method of work support and rotation. Without working from centers, true roundness is generated within .000025", and squareness with one end within .000025". Production is very high, comparing favorably with or exceeding the centerless method. ¶ CINCINNATI FILMATIC Micro-Centrics will outperform any other machine in precision grinding short work to exceptionally close accuracies of roundness, squareness with one end, and sizing. Investigate Micro-Centric's possibilities for reducing costs in your shop. Complete details may be obtained by writing for literature; brief data in Sweet's Catalog File for Mechanical Industries.



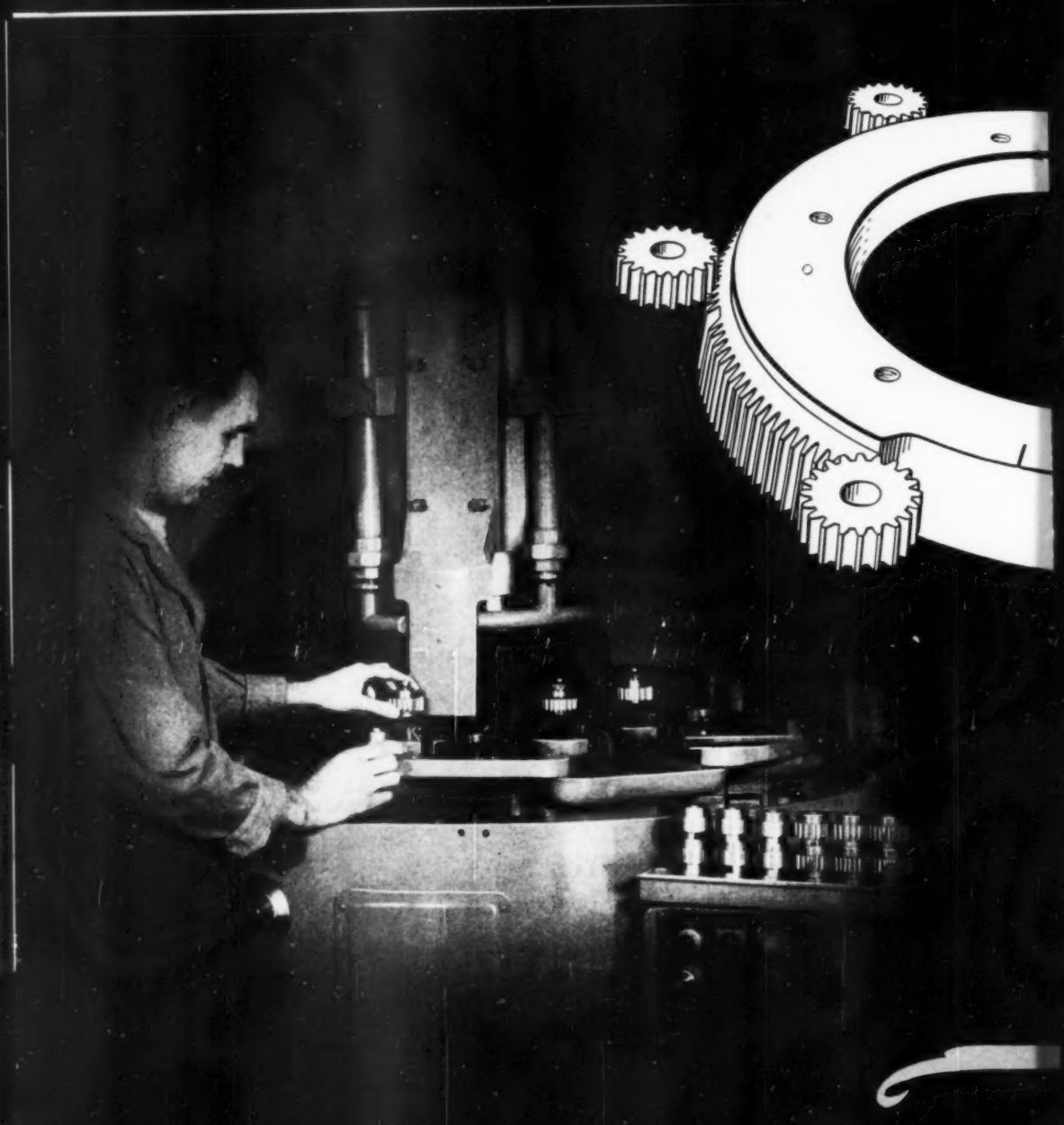
Micro-Centric Grinders may be equipped with automatic or manual loading fixtures; automatic or manual truing. Illustration shows a close-up of automatic fixture, and relation of driving plate, work, shoes, etc.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



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SHAVING MACHINES
THREAD GENERATORS
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For a Pitch Dia. to 3.375 in.*

Costs and Speed Commend

The Planetary

1 One big 17" cutter reciprocates continuously...

2 Work on 6 spindles are roughed and finish-cut, while revolving continuously around the cutter...

3 A gap provides for loading and unloading without stopping the machine

4 Fast roughing, fine finishing; easy cutter sharpening, are outstanding advantages

Mass Production gear cutting *where quality counts* is a job today, for a heavy-duty, Planetary principle Gear Shaper. Pinions and small diameter gears belong on the Fellows Planetary—with 6 busy work-spindles planeting around while the big non-rotating cutter reciprocates at high speed. The machine is built heavy and rigid, for maximum stock removal without loss of accuracy...on the 10 pitch, 20 tooth, cold-rolled-steel pinions pictured, cutter speed is 400 strokes per min., for 3/16" face width teeth—with a floor-to-floor output of *120 pieces per hour*. If you have a high-production requirement on similarly small gears, perhaps the Planetary can cut your costs way down, too. For consultation, or literature, call on the nearest Fellows office.

*Maximum pitch diameter of work is governed by several factors, such as: pitch, material and helix angle. For more complete information, submit your problems to our Engineering Department.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
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YOUR
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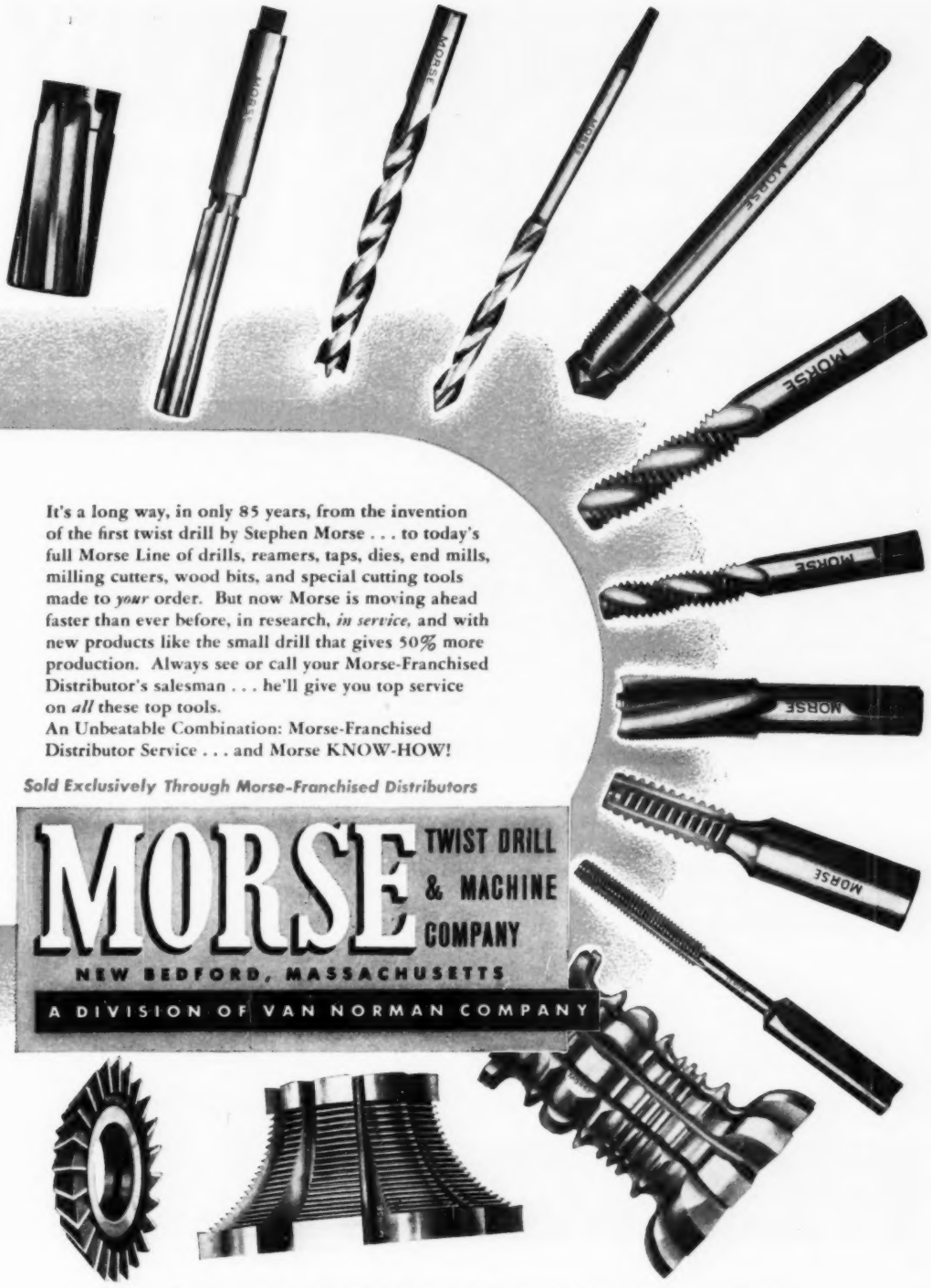
DISTRIBUTOR
Can Supply All your
Tool Requirements—
(REGULAR or ELECTROLIZED)



It's a long way, in only 85 years, from the invention of the first twist drill by Stephen Morse . . . to today's full Morse Line of drills, reamers, taps, dies, end mills, milling cutters, wood bits, and special cutting tools made to *your* order. But now Morse is moving ahead faster than ever before, in research, *in service,* and with new products like the small drill that gives 50% more production. Always see or call your Morse-Franchised Distributor's salesman . . . he'll give you top service on *all* these top tools.
An Unbeatable Combination: Morse-Franchised Distributor Service . . . and Morse KNOW-HOW!

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A DIVISION OF VAN NORMAN COMPANY

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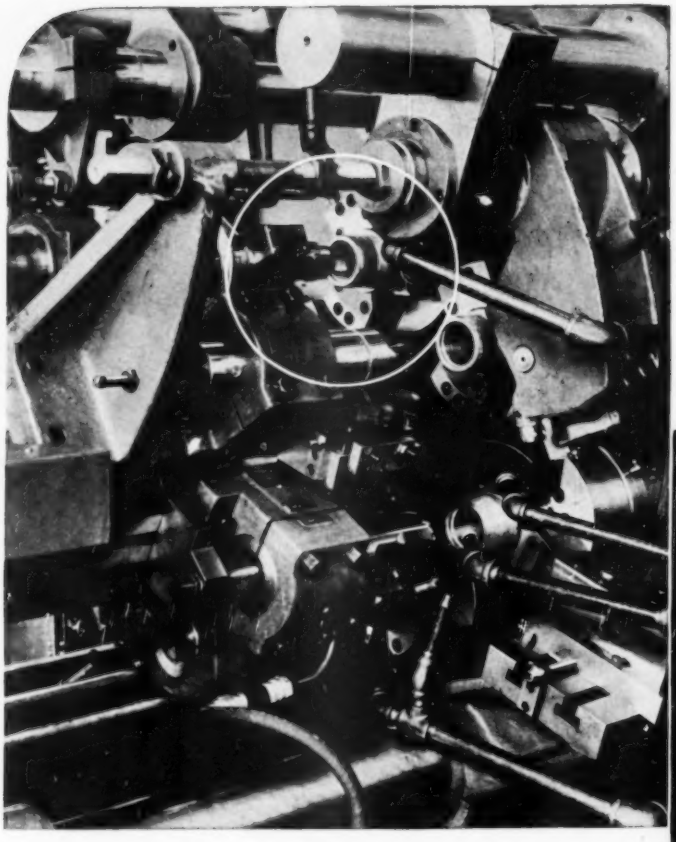
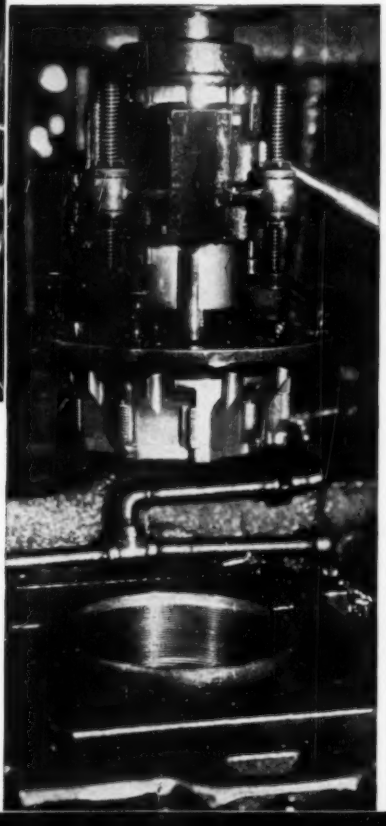
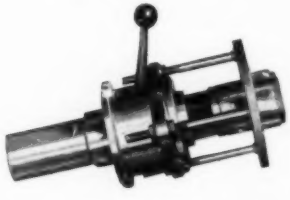


MANY WITH

DETACHABLE



LL Receding Chaser Collapsible Tap arranged for use as a Rotary Tap



ALT Collapsible Tap arranged for use as a Stationary Tap.

The LANDIS *Machine* COMPANY

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF

THREAD DIAMETERS ONE LANDIS TAP . . .

HEADS CUT WIDE RANGE OF INTERNAL THREADS

The LANDIS Collapsible Tap is a many-purpose tool—yet a single-purpose tool. The versatility of the LANDIS Tap enables it to handle a wide variety of jobs—yet it handles each job as though it were a specially-designed tool.

WIDE THREAD CAPACITY

The ability to cut thread diameters of varying sizes is an outstanding feature of all LANDIS Taps. The thread-cutting head is detachable and tap heads of various sizes and capacities can be used interchangeably on the same tap body. This design makes it possible to cut an unusually-wide range of internal thread sizes with a minimum tool investment. For instance, the 5ALT Tap will cut threads from 1⅝" to 6⅝" in diameter.

EASY REMOVAL FROM WORK

LANDIS Taps are constructed with a built-in **collapsing** action. Chasers drop free from the work into the tap head at the completion of the thread. The tap can be removed directly without "backing out," thus saving labor time and chaser wear, and reducing the number of torn threads.

INTERNAL TAPERED THREADS

LANDIS Taps are of two types—the ALT for parallel threads—and the LL for tapered threads. The LL Receding Chaser Collapsible Tap is especially designed to cut API Standard threads in any machineable material well within all required tolerances. This tap features a new receding action—a fulcrumed lever—which gives a positive receding movement to the chasers and allows precision thread tapers. The low cutting strains thus obtained lengthen chaser life and improve thread accuracy and finish.

GENERAL FEATURES

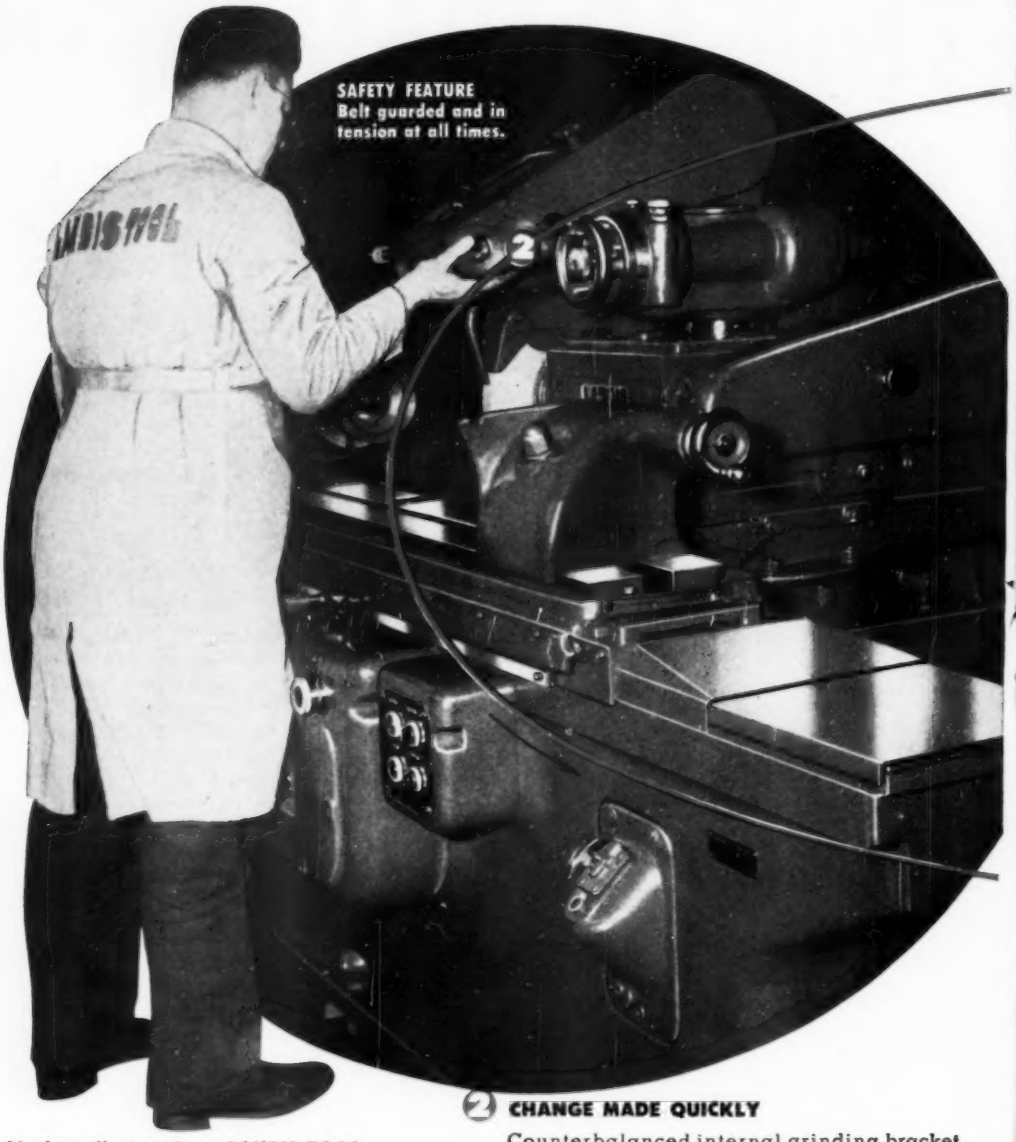
LANDIS Taps can be used as stationary or rotary taps, and can be quickly converted from one type to the other. Left-hand threads may be cut with the same tap bodies, using left-hand tap heads. All taps have a fine size adjustment which allows compensation for wear and regrinding, and the style LL Tap can be adjusted to compensate for slight errors in taper.

Consider the money-saving features of LANDIS Taps in cutting internal threads in your plant. Write for Bulletins G-94 and G-95.

LANDIS TRADE MARK REG. U.S. PAT. OFF.

WAYNESBORO
PENNA., U. S. A.

THREAD GENERATING EQUIPMENT



Machine illustrated is a LANDIS TOOL 12" LCH Hydraulic Universal Grinder.

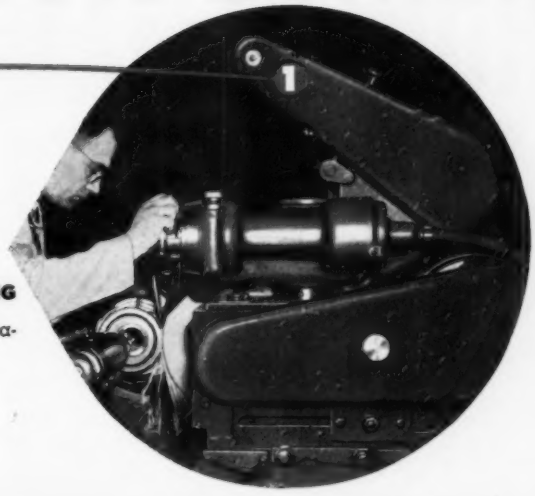
2 CHANGE MADE QUICKLY

Counterbalanced internal grinding bracket readily moved into grinding position.

LANDIS TOOL *Precision Grinders*

EQUIPPED WITH MICROSPHERE BEARINGS

For complete information on the features and specifications of LANDIS TOOL Precision Grinders refer to our section in Sweet's Catalog File or write for our new condensed catalog.



1 EXTERNAL CYLINDRICAL GRINDING

Fixture does not interfere with operator's head or vision.

QUICK CHANGING from external to internal grinding on LANDIS TOOL Universal Grinders

3 INTERNAL GRINDING

Rigid bracket locked in place with twist of knob.

features of LANDIS TOOL Hydraulic Universal Grinders

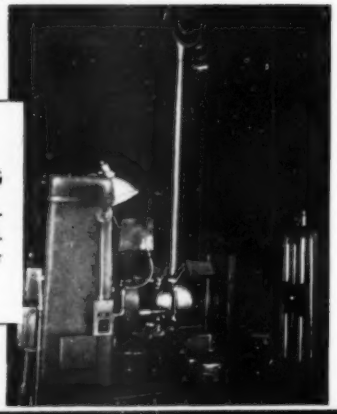
1. MICROSPHERE WHEEL SPINDLE BEARINGS
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

HOW TO HANDLE LONG AND UNWIELDY WORK

1 LATERAL MOUNTING
Milling the squares on a long shaft mounted at right angles to the machine spindle.

2 LONGITUDINAL MOUNTING
Drilling and reaming the flanged end of a large shaft. The end support has been removed to allow the workpiece to overhang both table and bed.



3 VERTICAL MOUNTING
Large connecting rod being bored and threaded. This is a simple setup for unusual work.

Open Construction of Horizontal Boring Machine Permits Unhampered Extension of Work in Three Directions

At times you may be confronted with machining unusually long or large workpieces. The open type construction of the horizontal boring machine permits the handling of this type of work. It is possible to set up unwieldy shafts or parts with extensions in any plane—vertical—longitudinal—lateral. Once the workpiece is mounted on the table, actual machining operations are quite simple.

No. 1—Lateral Mounting—Here is an example of how the squares of an exceptionally long shaft were machined. When milling the center square, the shaft balanced on the table. When machining the end squares, the shaft rested with one end on the table, and the other on a roller support, giving the table freedom to travel crosswise for milling.

No. 2—Longitudinal Mounting—Here is an example of how the flanges of a long shaft were machined. After removing the end support, it was only necessary to provide an auxiliary support for the shaft, equipped with rollers, to relieve the table and clamps of excessive strain. Free cross travel of the table, and vertical travel of the headstock permits drilling and reaming of all flange holes without trouble. Turning and facing of the flange, concentric with the shaft, can also be performed in the same setup, with our continuous feed facing head.

No. 3—Vertical Mounting—There are no overhead obstructions on a horizontal boring machine to interfere with workpieces. After setting up the connecting rod shown, boring and threading operations were simplified by using a continuous feed facing head.

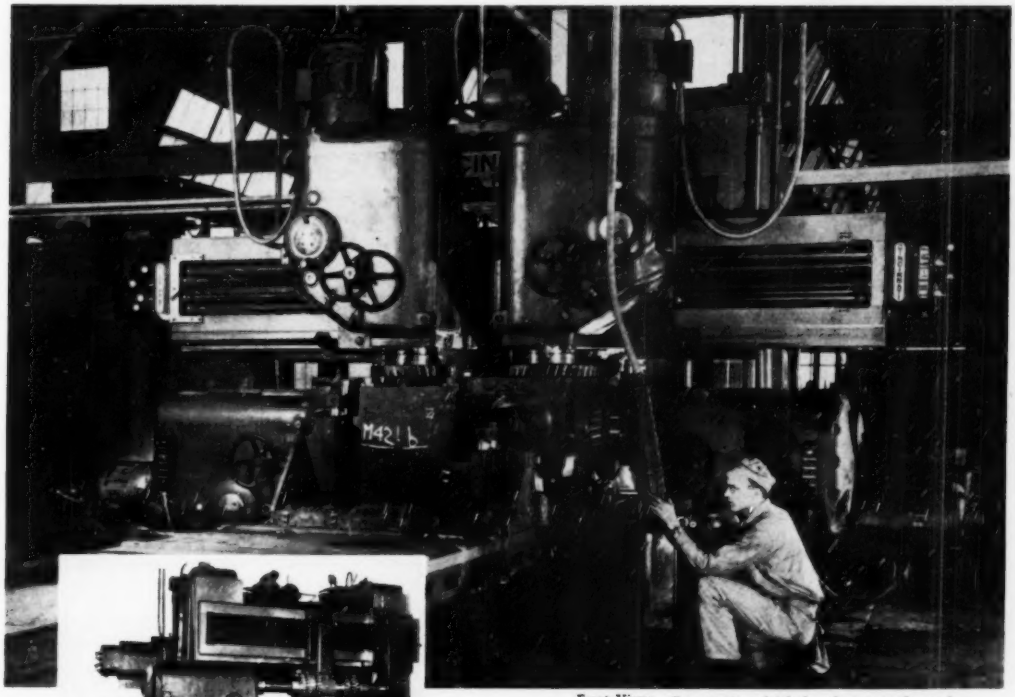
It would be impractical to mount and machine such work on any other type of equipment. Probably you have been confronted with similar problems. Experienced G. & L. engineers will be glad to help you solve your machining problems without obligation.

Additional Data

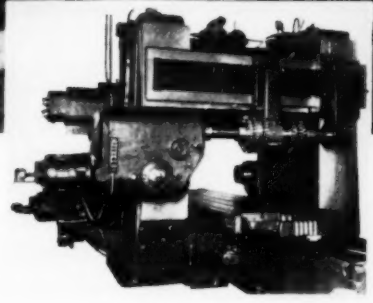
. . . covering the complete line of Giddings & Lewis machines and time saving accessories is included in our general catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin No. AM - 4 - 49.

GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.

Unusual Machining Cycle *Profitably* Steps Up Tractor Clutch Housing Output



Front View: Two tractor clutch housings are shown in this work holding fixture. A third housing directly behind these two is firmly held in the dual holding fixture.



Rear View: Arbor supports are mounted on a fixed rail. Any number of cutters may be placed on the arbor depending upon the operations performed. This feature adds to the machine's overall flexibility.

Electronic Drive and Dual Work Holding Fixtures Make It Possible To Remove Two Completed Housings As Work Progresses On Third

With this Cincinnati Hypro Planer type milling machine equipped with electronic controls and a dual work holding fixture, the machine operator is able to remove two completed clutch housings while operations continue on a third. Before the third housing is completed, however, the operator has time to reload the first fixture. As the electronically controlled automatic cycle advances, the third clutch housing is completed and then made easily accessible to the operator by table traverse. During this time, and while the operator removes the third housing, milling cutters are machining the rough castings that have just been placed in the first work holding fixture.

If you are confronted with multiple machining operations on similar parts, you will find distinctive machine features in the Cincinnati Hypro planer type millers that will reduce production costs. An inquiry now will enable experienced Cincinnati Planer Company engineers to assist you in successfully solving specific production problems.

Write for Bulletin No. 106

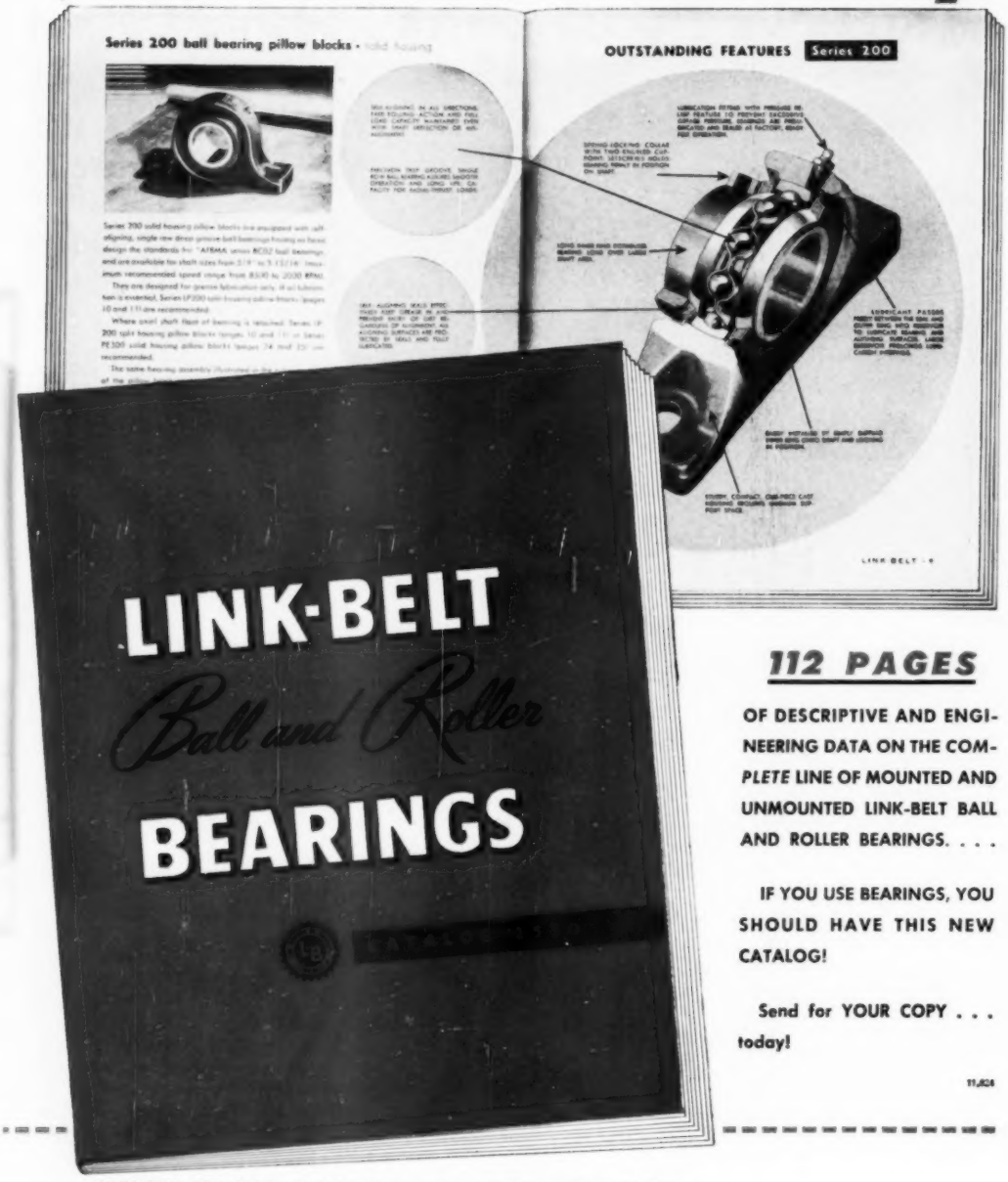
THE CINCINNATI PLANER COMPANY

(SUBSIDIARY OF GIDDINGS AND LEWIS MACHINE TOOL COMPANY)

CINCINNATI 9, OHIO, U. S. A.

HYPRO

YOUR COPY is Ready!



112 PAGES

OF DESCRIPTIVE AND ENGINEERING DATA ON THE COMPLETE LINE OF MOUNTED AND UNMOUNTED LINK-BELT BALL AND ROLLER BEARINGS. . . .

IF YOU USE BEARINGS, YOU SHOULD HAVE THIS NEW CATALOG!

Send for YOUR COPY . . . today!

11,824

LINK-BELT COMPANY, 519 N. Holmes Ave., Indianapolis 6, Indiana
(or your nearest Link-Belt office or Link-Belt bearing distributor): Please send Catalog 2550.

NAME _____

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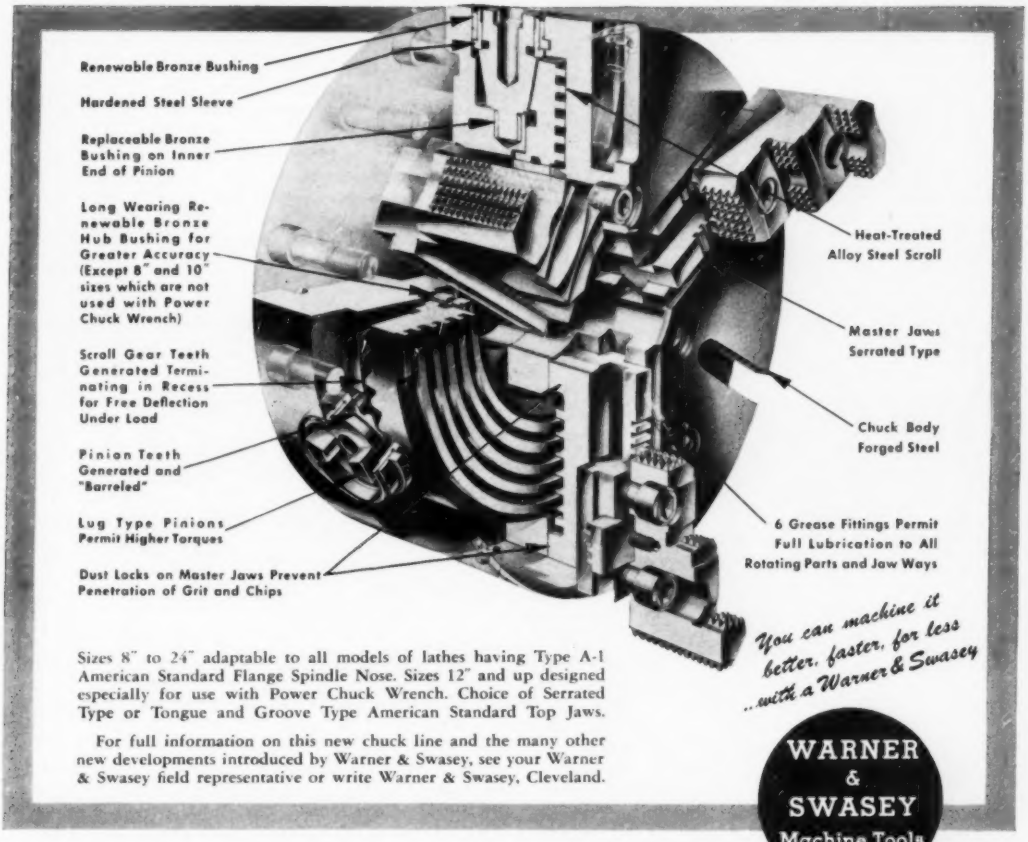
Here's why THE WARNER & SWASEY EXTRA HEAVY-DUTY GEARED SCROLL CHUCK

IS MORE RUGGED – EASIER OPERATING – LONGER LASTING


Renewable Bronze Bushing
Hardened Steel Sleeve
Replaceable Bronze Bushing on Inner End of Pinion
Long Wearing Renewable Bronze Hub Bushing for Greater Accuracy (Except 8" and 10" sizes which are not used with Power Chuck Wrench)
Scroll Gear Teeth Generated Terminating in Recess for Free Deflection Under Load
Pinion Teeth Generated and "Barreled"
Lug Type Pinions Permit Higher Torques
Dust Locks on Master Jaws Prevent Penetration of Grit and Chips
Heat-Treated Alloy Steel Scroll
Master Jaws Serrated Type
Chuck Body Forged Steel
6 Grease Fittings Permit Full Lubrication to All Rotating Parts and Jaw Ways

You can machine it better, faster, for less ...with a Warner & Swasey

Sizes 8" to 24" adaptable to all models of lathes having Type A-1 American Standard Flange Spindle Nose. Sizes 12" and up designed especially for use with Power Chuck Wrench. Choice of Serrated Type or Tongue and Groove Type American Standard Top Jaws.

For full information on this new chuck line and the many other new developments introduced by Warner & Swasey, see your Warner & Swasey field representative or write Warner & Swasey, Cleveland.

WARNER & SWASEY Machine Tools *Cleveland*

FOR FULL INFORMATION *SEND FOR FREE BOOKLET*

WARNER & SWASEY, Dept. 322, CLEVELAND 3, OHIO 12-49

Send Booklet on Warner & Swasey Geared Scroll Chuck

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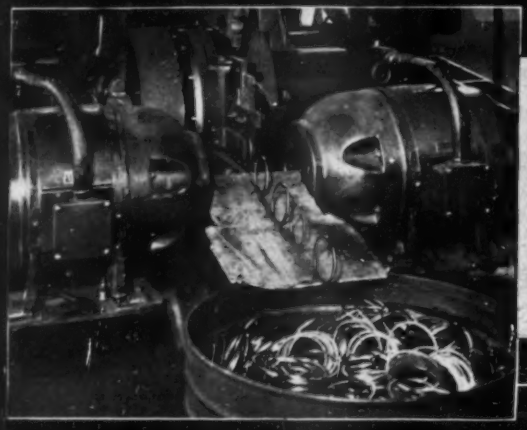
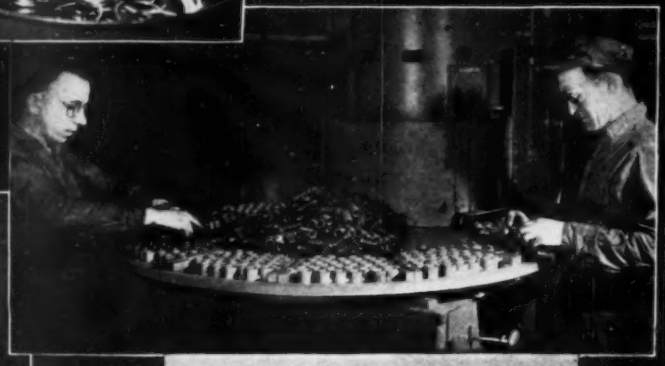
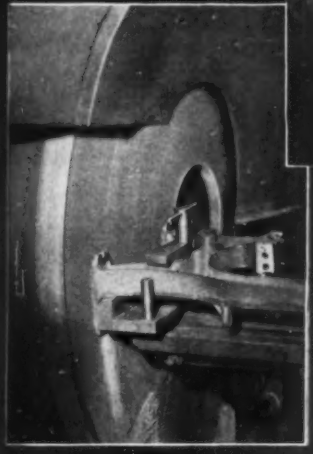
Yes, You Can Cut Your NORTON *Vitrified* DISCS



A large piston ring maker reports, "On a high production automotive piston ring grinding job, our rate of production was increased from 9,000 rings per hour to 12,000 rings per hour, by substituting Norton *Vitrified* bonded discs for the resinoid bonded discs used previously. We've cut grinding costs with these Norton *Vitrified* Discs, too, for now we grind four times as many rings per dressing, the discs last longer, and the initial cost of the discs is 12% lower!"





An Ohio spring manufacturing concern says, "We were grinding alloy steel automotive coil springs with a certain type of inorganic bonded discs, and the discs were lasting 125 hours. A switch to Norton Vitrified Discs raised our production 25% in springs per hour, and these new discs have an average life of 178 hours. It's easy to see why we've accepted these Norton *Vitrified* Discs as our standard for this job."

Disc Grinding Costs — *are doing it for others!*

You get a faster, cooler cutting action on many surfacing jobs with Norton Vitrified "P" or porous type discs, because the grain spacing in these discs is accurately controlled for extra chip clearance and the cutting action is uniform from periphery to hole. This makes them particularly well-suited for handling alloy steel and other heat-sensitive parts. Their scientifically controlled structure offers decided advantages over the old perforated discs sometimes used.

You get longer life on many surfacing jobs with these Norton discs because vitrified bond has the unique ability of holding the abrasive grain until its complete cutting life has been utilized, and then releasing the grain when it commences to dull. This eliminates the need for frequent dressing.

You eliminate aging and storing problems often encountered with discs of some types of bond when you use Norton *Vitrified* Discs, for vitrified bond is stable and mature. These Norton discs are ready for use immediately upon delivery or may be stored until needed as the grinding properties will remain unchanged.

You eliminate coolant problems, for vitrified bond is not affected by water or any commercial grinding fluid.

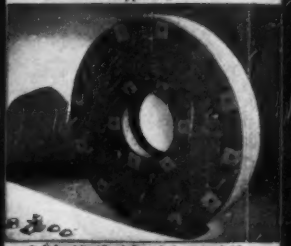
You save on initial expense, for vitrified bonded discs in sizes up to 30" in diameter cost considerably less than resinoid.

If you are disc-grinding piston rings, coil springs, ball-bearing races, magnets, etc., why not take advantage of these cost-cutting features offered by Norton Vitrified Discs? Your Norton abrasive engineer or distributor will be glad to study your disc grinding operations and to help you in selecting the most economical disc for each job.

W—1255

NORTON ABRASIVES

Solid—Vitrified Bond, Plate Mounted, Type PC



Solid—Vitrified Bond, Inserted Nut, Type N

Segmental—Vitrified Bond, Plate Mounted, Type PN

Segmental—Vitrified Bond, Inserted Nut, Type N

Segments—Resinoid Bond, Plate Mounted, Type PC

NORTON COMPANY WORCESTER, MASS. New York Chicago Detroit Cleveland Philadelphia Pittsburgh Hartford St. Louis Los Angeles

Improved Spindle Design

The diameter of this spindle has been increased to 3¼", adding 37% to its rigidity.

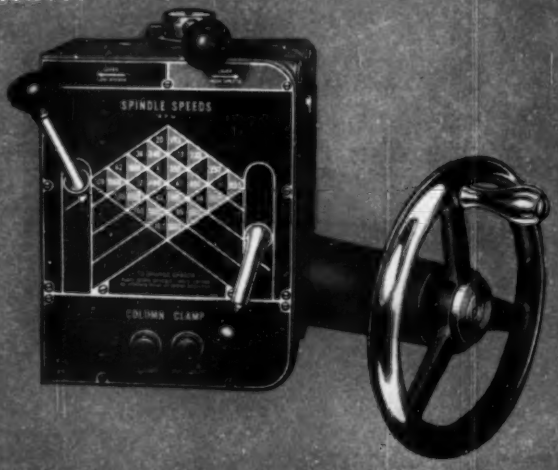
For long life the 100% anti-friction design of the Hole Wizard Spindle with adjustment for wear insures frictionless operation and maintenance of original accuracy. When severe drilling, tapping, or boring operations are performed thru the large driving gear of the Double Lo-Hung Drive, all thrusts are taken by the large bush, as shown by the accompanying illustration, which completely relieves the spindle of such stresses and definitely prolongs its life and accuracy.

The spindle and mating sleeve are made of nitralloy, nitrided to 70 Rockwell C—impervious to wear. Because of this extreme hardness, the running clearance between the ground spindle and honed sleeve is reduced to .00025". This spindle stability is especially valuable for exacting boring jobs.

Speed Changes made Quickly

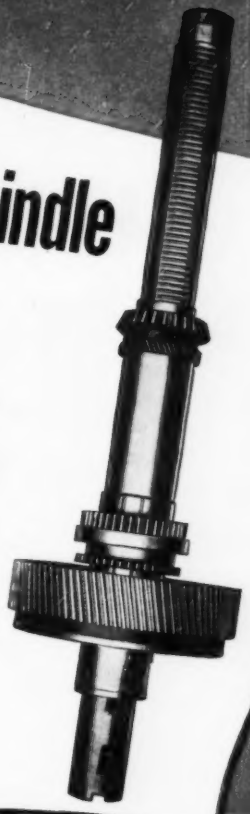
and without confusion . . .

The Hole Wizard speed-changing mechanism is DIRECT READING. The operator no longer has to refer to instruction charts in order to make speed changes. The speeds are right in front of him in plain view and all he has to do is to move the levers to the speed he wants. The ease and rapidity of speed changing on the Hole Wizard encourage the operator to use correct speeds for his work.



THE AMERICAN TOOL WORKS CO.

The Double Lo-Hung Spindle Drive has definite virtues



This combination insures long gear life, a continuance of smooth power flow and freedom from gear noise.

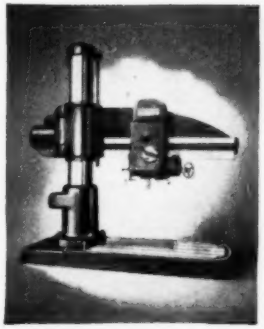
It provides two (2) spindle driving gears. Of the 32 spindle speeds provided the 16 high speeds are secured thru the smaller of the two gears while the 16 slow speeds are secured thru the larger gear. By providing a smaller diameter driving gear for the high speeds, gear velocities can be held within reason, and by providing a large driving gear for the slow speeds, which are used for the severest operations, gear tooth pressures are kept correspondingly low.

It minimizes tooth pressures from severe operations.

It reduces the velocity of the driving gears on high spindle speeds.

This ideal drive which divides the driving service between two gears is exclusively "American".

Design Features that pay dividends to Hole Wizard Users...



1. Automatic oiling and cleansing of column sleeve to prevent "column scoring."
2. Tapping attachment speed-up that backs out taps 40% faster than tapping speed.
3. All gears and shafts hardened—all bearings anti-friction—elevating screw and back shaft hardened. All units anti-friction mounted and automatically oiled.
4. Safety nut guaranteed to prevent arm from dropping—a valuable safety feature.
5. Spindle speeds direct reading, instantly selected and secured—encourages operators to use correct speeds.
6. Auxiliary spindle counterbalance for handling heavy tools—provides same tension on spindle throughout entire travel.

Cincinnati, Ohio U.S.A. LATHES AND RADIAL DRILLS

See what they did with U·S·S Free-Machining MX

If you're looking for ways to increase production and reduce costs on machined steel parts, this typical production run of U·S·S Free-Machining MX Bar Stock deserves your careful consideration.

U·S·S Free-Machining MX Bar Stock—today's fastest-cutting Bessemer Screw Stock—has been available to the screw machine industry for only a short time, but, in many other production-run tests like these, its ability to boost production, improve product finish, to maintain closer dimensional accuracy, reduce rejects and prolong tool life has been amply demonstrated. These results merely confirm what exhaustive laboratory tests covering a period of five years had led us to expect.

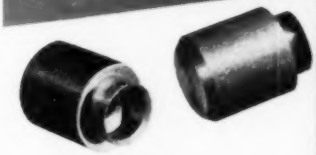
Why not find out how this new free-cutting bar stock works on your equipment? It may be just what you need to improve your product quality or to cut your costs. You can obtain U·S·S Free-Machining MX in cold-finished bars from your regular supplier. In hot-rolled bars, MX is available through our nearest district sales office. A qualified metallurgical representative will gladly discuss its possibilities with you.

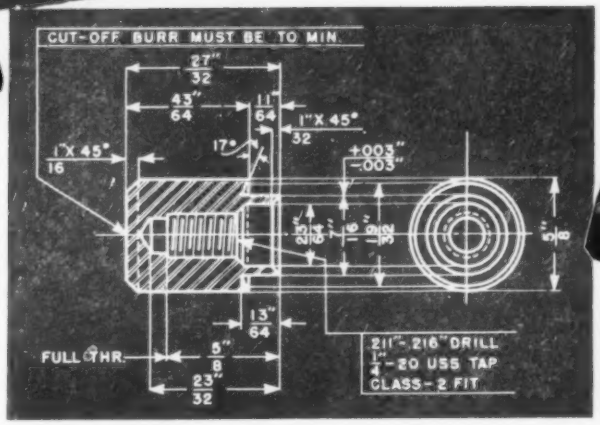
USS

Bar Stock on these drum nuts . . .

. . . INCREASED TOOL LIFE 96%

OPERATING AT 345 SURFACE FEET PER MINUTE*





HERE'S THE JOB

The part produced is a 1¼" drum nut, four of which are swaged to the top of grease drums so that pump can be attached. Part is made from cold-drawn 2⅜" round screw stock. Machine used is a four-spindle 7/8" R Acme-Gridley Automatic.

(Parts were produced by Screw Machine Specialties Co., Pittsburgh. Material furnished in cold-drawn form by the Wyckoff Steel Co.)

SEQUENCE OF OPERATIONS

FOURTH POSITION	**Feed Stock** **23/64" drill** **Finish form tool**
FIRST POSITION	**#3 (.214") drill** **Rough form tool**
SECOND POSITION	**Turning tool** **#3 (.214") drill** **Breakdown tool**
THIRD POSITION	**1/4" tap** **Cut-off tool**

NOTE: Although this was a production test run of material, operating conditions were set so that the machine would operate exactly as in regular production. All elements—speed, tool and machine conditions—were carefully standardized so that they were identical for both steels. The same operator was used throughout. Results tabulated here are the average obtained, not from just a few bars, but from a substantial number of regular production runs.

HERE ARE THE RESULTS

Material	Seconds per Part	Output Rate per Hour	SFM	RPM	Drill Feed	Tool Life	Parts per Tool change**
Reg. B-1113	3.17	1135	285	1719	.0078"	8.0 hrs	6,356
U·S·S MX	2.86	1260	345	2110	.0078"	13.5 hrs	12,493

**(Based on 70% efficiency)

* As is evident from the above, U·S·S MX when run at 21% greater speed than regular B-1113 materially increases production and almost doubles output per tool grind. Even at the unusually high machine speed of 381 SFM, when output increases 16.2%, tool life still remains greater than for that of regular B-1113 run at 33% slower speed.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH AND CHICAGO · COLUMBIA STEEL COMPANY, SAN FRANCISCO · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM

UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

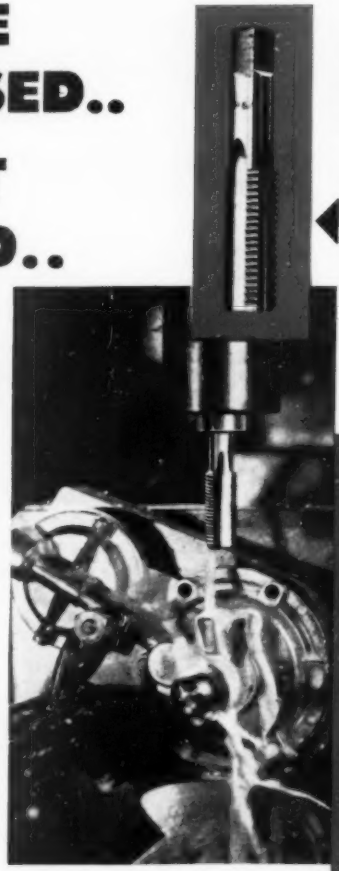
UNITED STATES STEEL

TAP LIFE INCREASED..

TOOL COST DECREASED..

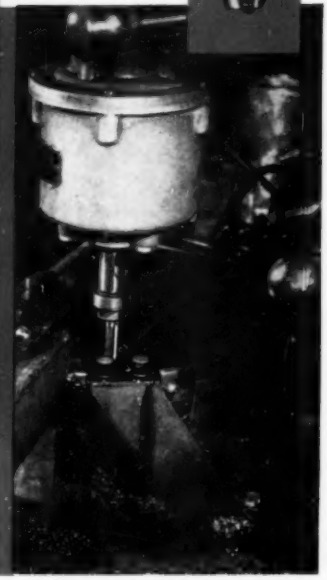
with P&W TAPS

Here are two widely separated jobs that *prove* there's a difference in Taps. In each case, the comparison is based on the same operation, the same material, the same machines. The only difference — *and a BIG difference* — is in the *"make"* of Tap. P&W "know how" in design, precision manufacture and special treatment gives more tapped holes per Tap — a plus factor on any job.



On this job: P&W ½" — 20 NF, HSS Commercial Ground Thread Bottoming Hand Tap, specially heat treated for the job.

On this job: P&W 5/16"—24 NF, HSS Commercial Ground Spiral Point Plug Hand Tap, given our special heat treatment.



HERE'S ONE INSTANCE

Tool engineers in a midwest plant couldn't overcome excessive tap wear on a zinc die casting job — until they changed over to P&W TAPS. Under the same conditions, P&W stock taps (specially treated) produced many times the number of tapped holes per grind . . . in fact **TAP LIFE INCREASED OVER 300%**

. . . HERE'S ANOTHER

A New England tool and die company had been tapping in cold rolled steel, obtaining only a few thousand holes per tap. P&W TAPS were applied to the same job with the same equipment. **RESULT: TAP LIFE INCREASED 270%**

Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

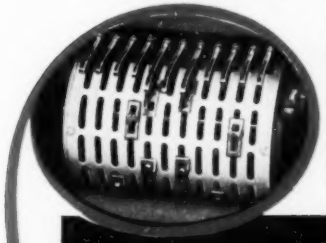
P&W TAPS

Branch Offices and Stocks: Birmingham, Boston, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco

POTTER & JOHNSTON
3U SPEED-FLEX FULLY AUTOMATIC TURRET LATHE

PAYS OFF 3 WAYS

INGENIOUS DOG DRUM PROVIDES PRECISION CONTROL OF TURRET TOOLS TO ATTAIN MAXIMUM PRODUCTIVITY WITH ECONOMY



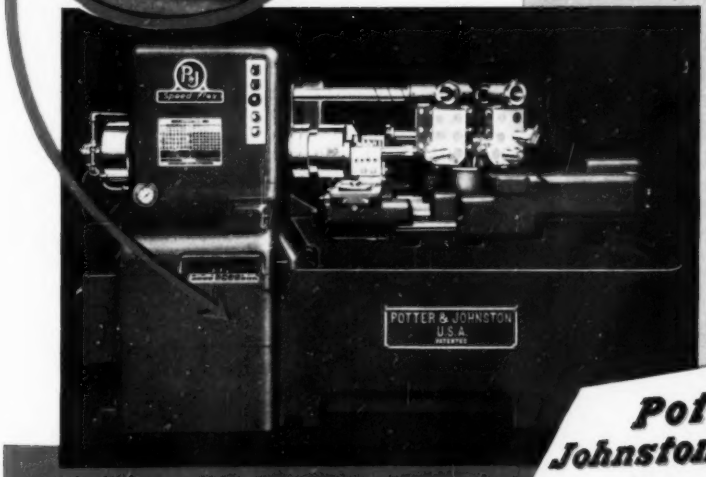
Adjustable Dogs on Drum pictured at the left provide complete flexibility, and positive, fully automatic control of turret slide action in direct relation to spindle speeds — to meet all machining requirements, however intricate, at all turret positions. Details: Dogs are easily adjusted to select any of 4 spindle speeds . . . select any of 3 turret slide feeds . . . actuate turret slide feed . . . actuate turret slide rapid traverse . . . stop turret slide . . . stop spindle.

1 **Fewer Rejects — accompanied by better work and more of it.**

2 **Increased Productivity — combining cuts, reducing machining times, eliminating unnecessary work handling.**

3 **Greater Economy — in tool life, tooling costs, operating costs, labor costs.**

P&J-engineered Tooling on the P&J 3U Speed-Flex is the most direct way to attain maximum Productivity-with-Economy on high speed, multiple-operation work up to 6" in diameter. Get a P&J estimate on any job in this class — and compare. You'll find that P&J's 50 years' experience in this field of production metal-working pays off.



Send sample parts or prints for P&J Tooling recommendation and estimate, and ask for your copy of the 3U Speed-Flex Bulletin.

PRECISION + PRODUCTIVITY = ECONOMY
on work up to 6" diameter on the
3U SPEED-FLEX AUTOMATIC

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

P&J

Only MARVEL *builds all four**

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds *BOTH* hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and *unbiased* recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing *machines* and metal sawing *blades*. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

Write for Catalog 49

***HACK SAWING MACHINES**

***BAND SAWING MACHINES**

***BAND SAW BLADES**

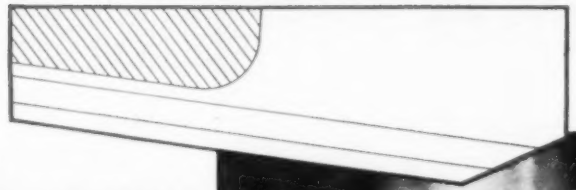
***HACK SAW BLADES**

4

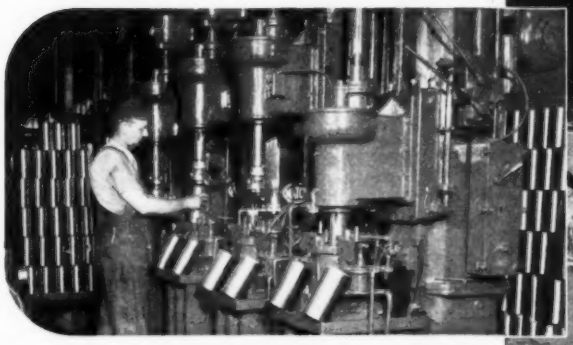
ARMSTRONG-BLUM MFG. CO.
BLOOMINGDALE AVE., CHICAGO 39, U.S.A.

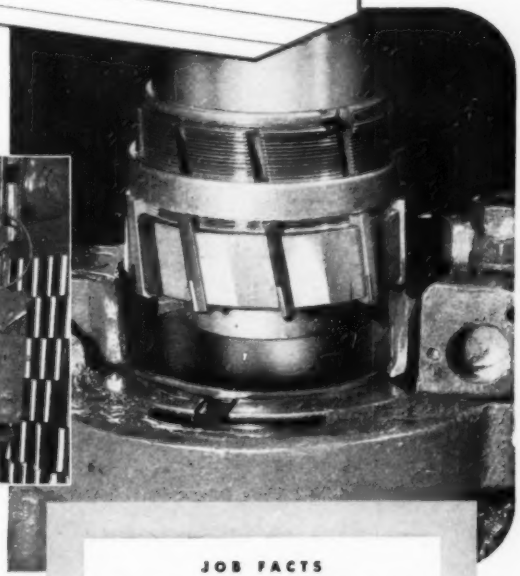
MARVEL Metal Cutting SAWS
No. 9A Marvel Hack Saw
No. 8 Marvel Band Saw
MARVEL High-Speed-Edge HACK SAW BLADE
MARVEL Metal-Cutting BAND SAW BLADE

BARBER-COLMAN *Design* SAVES 15% TOOL COST



ON CARBIDE-TIPPED REAMERS FOR CYLINDER LINERS





These Barber-Colman Inserted Blade Reamers are producing truck cylinder liners with accurate, straight, round holes, free from welts or taper, at a tool cost of 15% less than previous records. Material reamed is cast-iron.

Replaceable blades with carbide-tips give long life to the reamers, and cutting edges which stand up under continuous production. 675 more pieces per set of blades are now obtained, and tool cost per 100 liners has been reduced from $1.57 to $1.32.

When you want dependable low cost production from the cutting tools used on your machines, specify "Barber-Colman JOB-ENGINEERED".

JOB FACTS

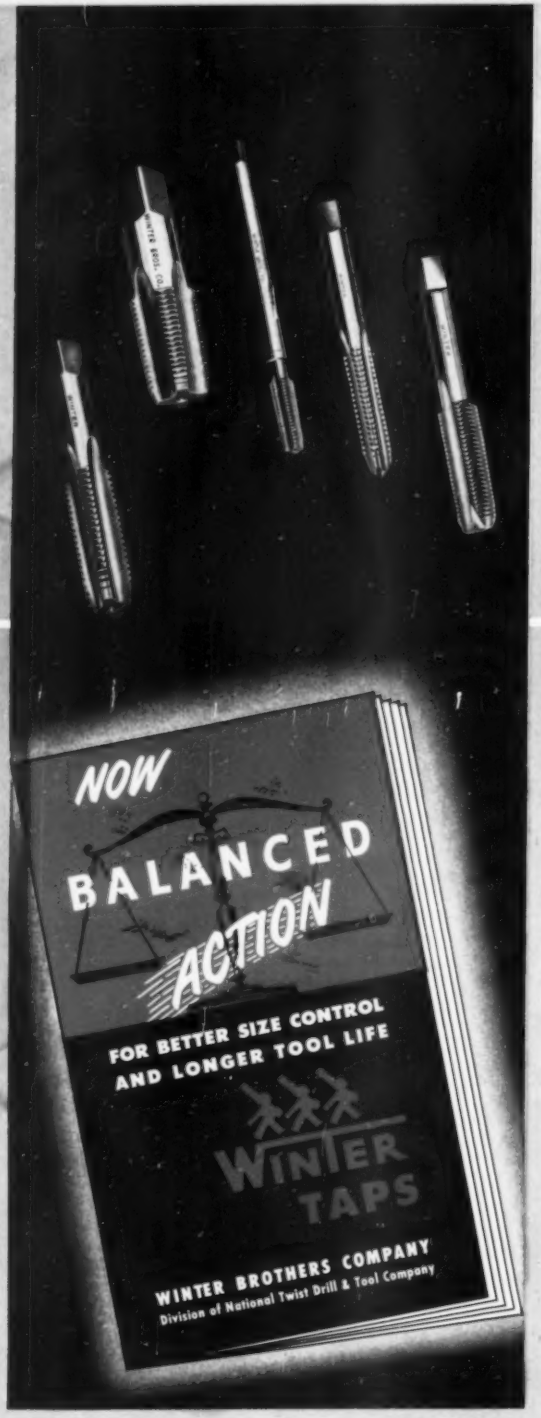
Operation — Finish ream cylinder liners
Material — Cast Iron, 45-55 R.C.
Stock Removed — .018"
Tool Life — 108 pieces per sharpening, formerly obtained 95
Feed per Rev. — .087" Speed — 40 RPM
Tool Cost — Per 100 pieces, reduced from $1.57 to $1.32

FREE!

Write for additional Data Sheets covering other reaming applications. Ask for Series No. 5151

Barber-Colman Company

GENERAL OFFICES AND PLANT, 5151 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



WINTER

"BALANCED ACTION" TAPS

Winter Brothers now offer you the newest development in taps: "Balanced Action"—for uniform and accurate tapping. *Balanced Action* is an exclusive Winter development and applies to the complete Winter line of chip driver, hand, machine screw, nut, pipe, pulley, and stove bolt taps. It is made possible by new technical advances in Winter manufacture, giving highly accurate flute spacings, flute contours, chip driver contours, and chamfers. The result is better size control and longer tool life. A complete description of this new advance in tap design and manufacture is given in the new booklet, "Now—Balanced Action." Write for your free copy.

ALWAYS AT YOUR SERVICE

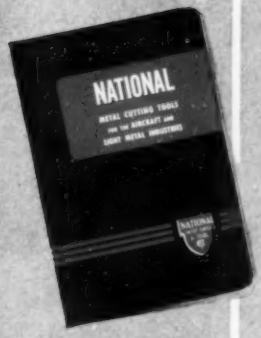
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

FOR HEAVY WORK IN LIGHT METALS . . .

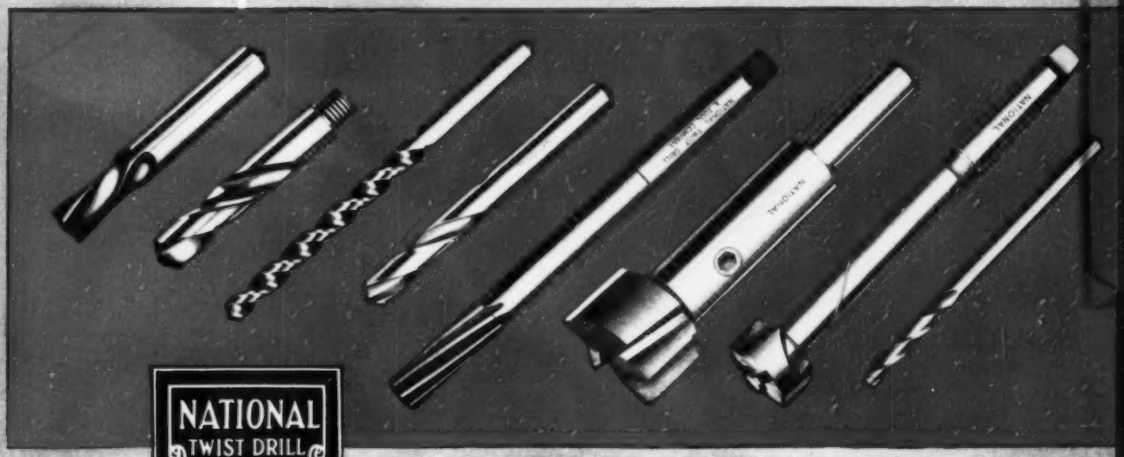
NATIONAL CUTTING TOOLS



National's complete line of rotary metal cutting tools includes many of special usefulness to the aircraft and other light metal industries. Typical are the router bit, threaded shank drill, twist drills, chucking reamer, counterbore, and inverted spotfacer shown below. Designs feature highly polished flutes to reduce friction and high helix angles to facilitate chip ejection. All are of extra sturdy construction. National's light metal tools are fully described in a new catalog supplement, "National Metal Cutting Tools for the Aircraft and Light Metal Industries." A copy is yours on request.

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial product.



NATIONAL TWIST DRILL & TOOL ROCHESTER MICH. U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

news plus +

Tray-top fixed gap bed Engine Lathes—15 & 18 swing sizes. Bulletin T-100

Tray-top Engine & Toolroom Lathes—10, 12½, 15 & 18 swing sizes. Bulletin T-100

Standard Engine Lathes—14, 16, 18, 20, 22 & 24 swing sizes. Bulletin S-100

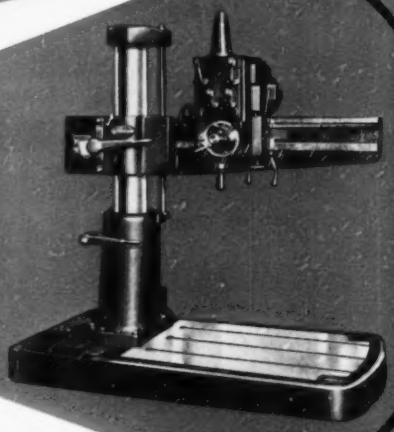
Standard fixed gap bed Engine Lathes—14, 16, 18, 20, 22 & 24 swing sizes. Bulletin S-100

Cincinnati Lathe & Tool Co. announces with pride the acquisition of one of the largest, oldest, and most widely recognized lines of light, upright, sensitive, and radial drilling machines – formerly produced by The Canedy-Otto Manufacturing Company. So now, from one organization, you can obtain the best in economy priced drilling machines and accessories as well as medium (Standard) and light duty (Tray Top) lathes, backed by a leading name in lathe manufacture. Write today for new catalogs.

16" Royal sensitive bench and floor drill, single and multiple spindle. Bulletin 210.

16" Royal sensitive bench and floor drill, single and multiple spindles. Bulletin 216.

21" Box column sliding head floor drill, single spindle. Bulletin 100A.



Radial drills—3', 4', 5' arms; 7", 9" and 11" column. Bulletin 116 and CO-15.

16" Box column sliding bench and floor drill, single spindle. Bulletin 155V, 119, 215.

21" Box column sliding head floor drill, multiple spindle. Bulletin 100A.

cincinnati LATHE & TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO

CANEDY – OTTO

DIVISION

A completely rebuilt motor is tested with dynamometer. This machine applies low voltage and overloads exactly as in actual usage.

Complete Facilities

KEEP ELECTRIC MOTORS ON THE JOB

California Electric Works, San Diego, features modern equipment, large stock of parts, 2 shift operation, 24 hour service in emergencies to give top-flight Allis-Chalmers Certified Service

In San Diego, and *every* major industrial center in the United States you will find an outstanding, independent Allis-Chalmers Certified Service shop.

These shops have been carefully picked for their experience, highly skilled workmen, modern equipment and business reputation. Each uses nothing but factory approved methods and parts.

So when you need service on electrical equipment, call the nearest Allis-Chalmers Certified Service shop. You can be sure of fine workmanship, fast service and fair prices.

GOOD SOURCE FOR NEW MOTORS, TOO

Your Allis-Chalmers Certified Service Shop or Authorized Dealer can give you the same fast, dependable delivery on new motors. Whichever you need, new motors or service on your present equipment, you can depend on your Allis-Chalmers Certified Service shop. A-2885

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

THE GREENFIELD STORY

of Service and Quality

Good Neighbor

You have a neighbor who has a complete stock of "Greenfield" threading tools, waiting for your call.

He's a good neighbor. He knows his business. He's friendly and anxious to serve you. He may be able to help you with a threading problem and save you a lot of money.

This neighbor of yours is the "Greenfield" Distributor. There are over 1,000 of them, located in every industrial neighborhood in this country. Working closely with him, and at your service also, is a trained "Greenfield" threading tool engineer. They make a team of good neighbors that have been serving American industry, in war and in peace, for over 75 years.

GTD

GREENFIELD

Be Sure

Buy "Greenfield"

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

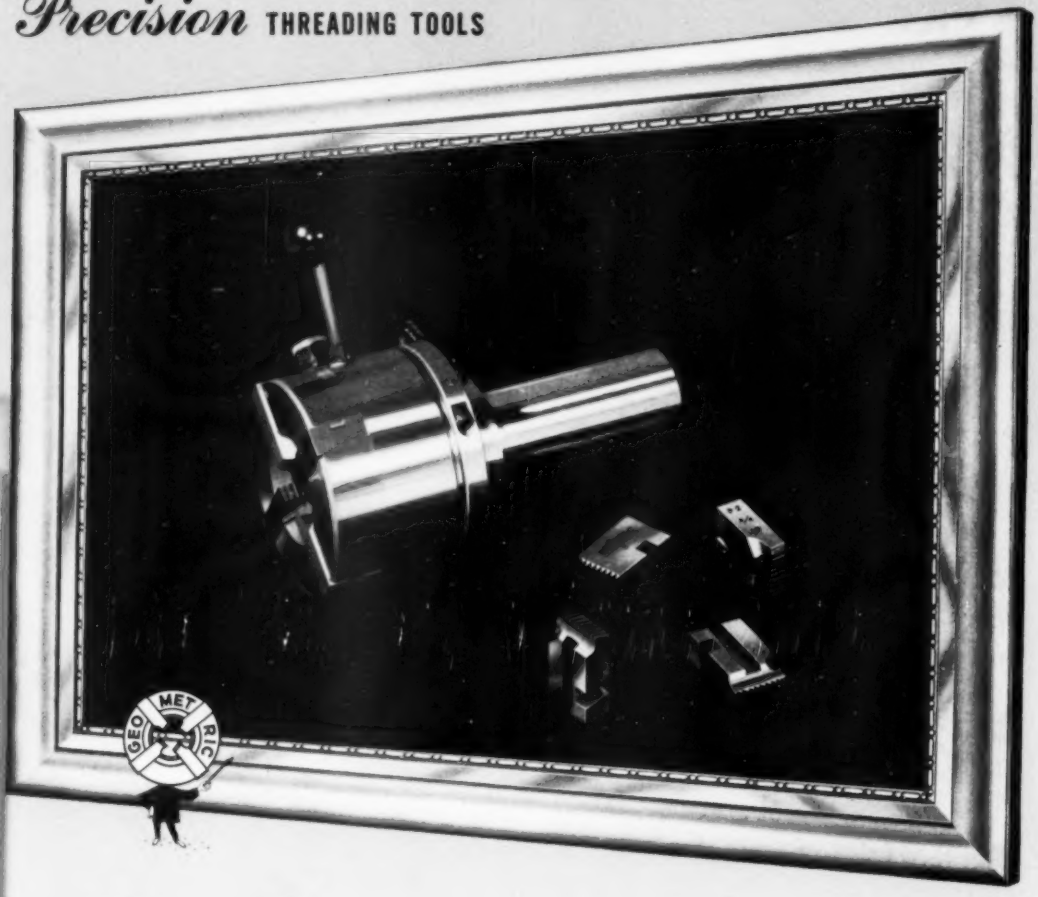
and

GTD AMPCO

AMPCO TWIST DRILL CORP. ★
Jackson, Michigan

Divisions of Greenfield Tap and Die Corporation

Precision **THREADING TOOLS**



Self Opening Style D Die Head and Chasers

A heavy duty die head of the stationary type which will cut National Coarse, National Fine and National Pipe Threads. Can be used for finer pitches.

★ ★

Available in seven sizes with a cutting range of ⅛" to 2½" diameter.

★ ★

GEOMETRIC also makes a complete line of Rotary and Stationary Self Opening . . . and Solid Adjustable Die Heads—Collapsing . . . and Solid Adjustable Taps—and GEOMETRIC Chasers.

"Be Sure . . . Buy Geometric"

THE
GEOMETRIC
TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

GTD

GTD AMPCO

a smart move

WHEN YOU SWITCH TO CIMCOOL

For CIMCOOL° LOWERS METAL CUTTING COSTS! This revolutionary cutting fluid—this *chemical emulsion*—saves money three important ways:

LONGER TOOL LIFE (and therefore less down time) because of Cimcool's *chemical lubricity*.

FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts cost of cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

Write for free booklet, "Cimcool Gives the Answers." Address, Sales Manager, Cimcool Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

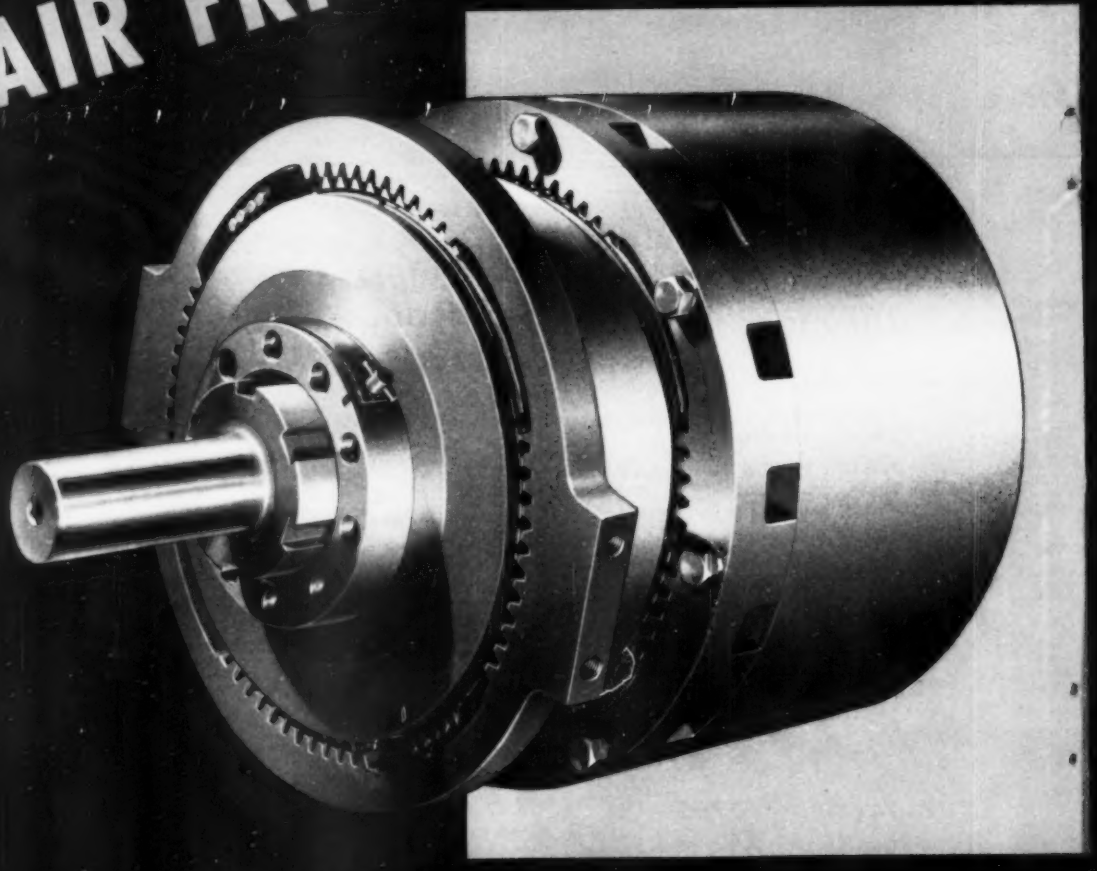
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

Why This

NIAGARA

AIR FRICTION CLUTCH



NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N. Y.

is Another Reason for satisfaction with NIAGARA *single and double Crank Presses*

● On single stroking operations where the going is tough, Niagara Air Friction Clutches have met every test of time and service.

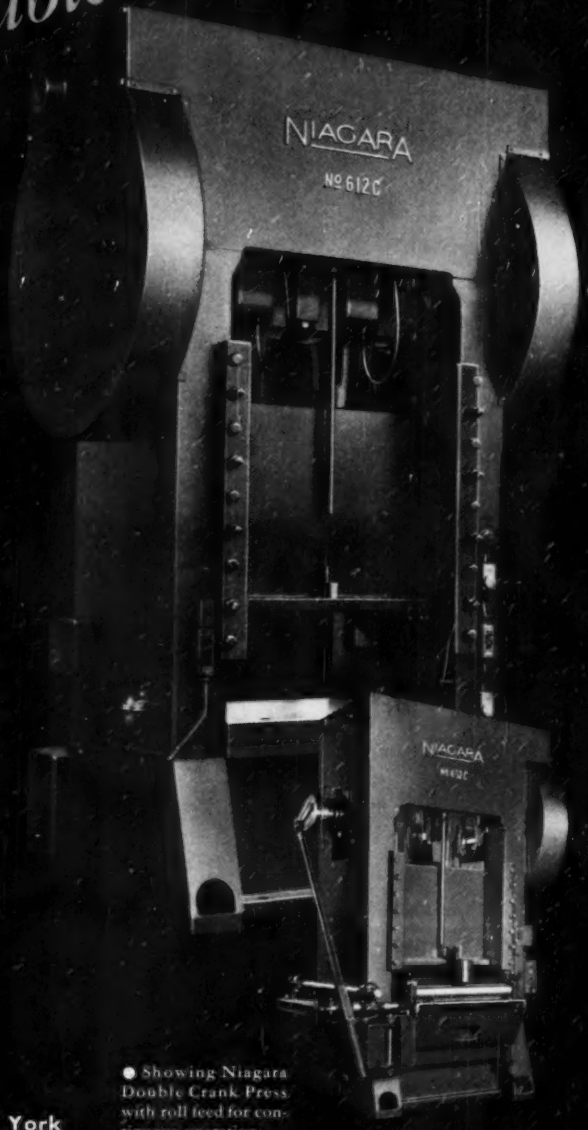
Safe, effortless push button control contributes to maximum hourly output. Controls can be arranged in various ways to suit all operating conditions. Clutch and brake action is instantaneous, smooth and quiet. There can be no overlapping of clutch and brake action. Extra locking palm buttons can be supplied for additional operators.

Pressure on all buttons not locked out of the circuit is required to release the brake and engage the clutch. Release of any one button on the down stroke disengages the clutch and applies the brake causing the press to come to an immediate stop.

Slide can be inched for adjusting dies.

Flywheel mounted on anti-friction bearings. Clutch maintenance is cut to a minimum.

Photographs at right show modern Niagara Double Crank Presses. They are available in a wide range of sizes and capacities.

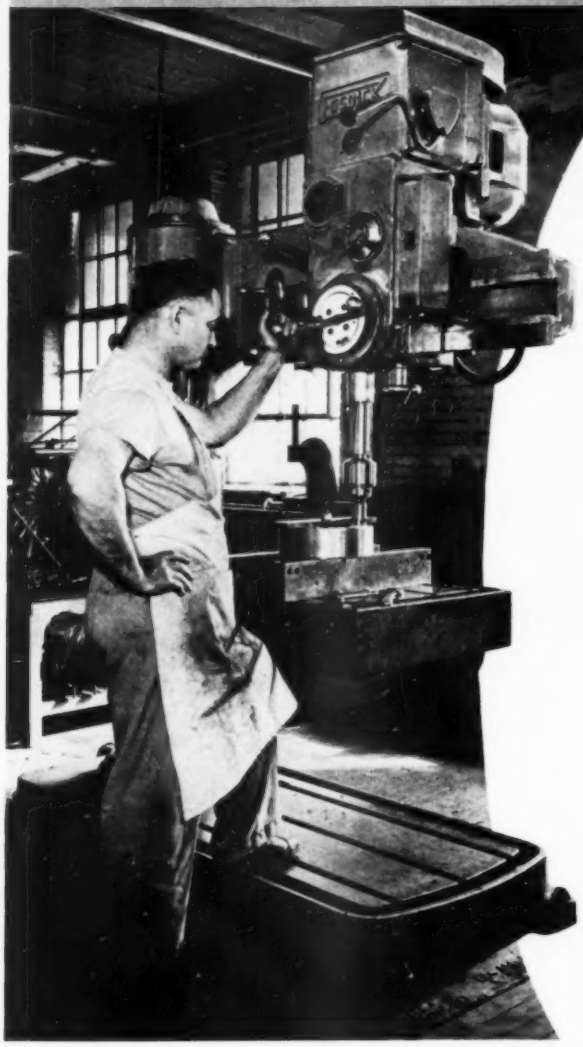


● Showing Niagara Double Crank Press with roll feed for continuous operation.

District Offices: **Detroit, Cleveland, New York**

Two Machines in One!

FOSDICK SENSITIVE RADIAL



It's a Sensitive It's a Radial

● To fully appreciate the wide application of this versatile machine you should see one of these Fosdick Sensitive Radials in operation.

It has all the high speed features of a Sensitive Drill plus the heavy construction, rigidity and flexibility of a Radial.

Here are a few of its many advanced features—

- 12" diameter one piece column construction.
- Fixed arm which swings 360° around column.
- Adjustable table which swings 360° and may be positioned to suit any drilling job.
- Table moved by power or hand.
- Tool ejector.
- New patented semi-automatic tapping control.
- Fluorescent tube for lighting entire table.

Illustrated is a Fosdick Sensitive Radial installation at East Alton, Illinois. The wide acceptance of this highly versatile machine tool is largely the result of its adaptability to such a large number of drilling operations in so many different kinds of work pieces.

If you want to cash in on the savings offered in this moderately priced all purpose sensitive radial, put one to work in your shop.

For specific details as to design construction and application, write for the Fosdick Sensitive Radial Bulletin S. R. A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

Steel-Weld FABRICATION

This 24 inch main pivot journal bearing, formerly produced in casting form, was redesigned by Mahon engineers for Steel-Weld Fabrication. It is typical of thousands of heavy machinery parts and assemblies produced by Mahon for manufacturers throughout the country. Whatever your requirements may be, regardless of size or weight, you will find in the Mahon organization an unusual source for welded steel in any form . . . a source with complete machining facilities, and a staff of design engineers and craftsmen from whom you may expect a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY

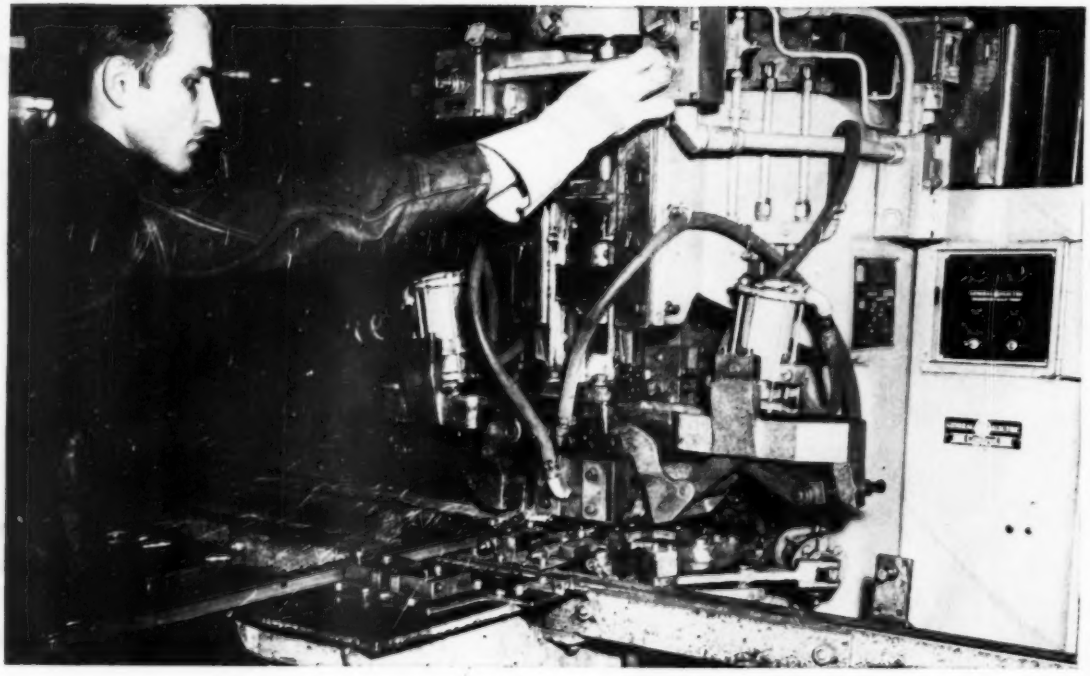
DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON

G-E NONSYNCHRONOUS

Better than ever



All the control you need—including accessories—is contained in the modern attractive cabinet. Combines all the advantages of standard components with the specialized details and refinements required for your work. Nonsynchronous control is commonly required for welding standard steels such as are used for automobile bodies, stoves, furnaces, refrigerators, motors, etc. Here it is used for welding hinges to a steel window frame at Copco Steel and Engineering Company, Detroit, Michigan.

GENERAL ELECTRIC

CONTROL for resistance welding

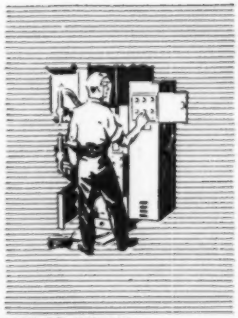
at lower Price!

G-E nonsynchronous control for resistance welders has been simplified, price reduced about 8 per cent.

Only two relays as compared to the previous six cut sequence time, mean faster operation. There is less wear, therefore, less maintenance required. The entire unit is more compact—takes less space. Timing is now controlled electronically.

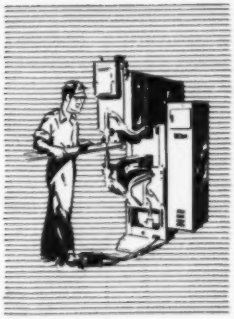
General Electric development engineering and improved manufacturing methods have again resulted in lower prices, better operating methods for the user of resistance welders. This is an example of the continued efforts at General Electric to give you more precise control of this process. When you have resistance welding control problems, contact the nearest G-E sales engineer. You'll be sure of unbiased answers. You'll get the *right* control for the job. And when you order control—specify General Electric.

SEE "This is Resistance Welding"...
General Electric's More Power to America four-color, sound motion picture covering every phase of this manufacturing process. Contains tips for improved production for operators of machines, design engineers, and supervisors. Contact your Resistance Welder manufacturer, Power Supplier, or the nearest G-E office.



EASY TO INSTALL—
compact, factory assembled unit may be mounted on the side of the machine, floor, nearby wall, or balcony as space permits.

EASY TO SERVICE—
entire side of cabinet is a hinged door which opens to provide quick, easy servicing of circuit components, power tubes, and water system. ▶



EASY TO OPERATE—
control station usually faces operator, but may be installed at the side of unit when mounted on machine, or may be separate from unit if remote control is desired.

SEND COUPON TODAY!

Apparatus Dept.,
General Electric Co., Sec. B 645-51
Schenectady, New York

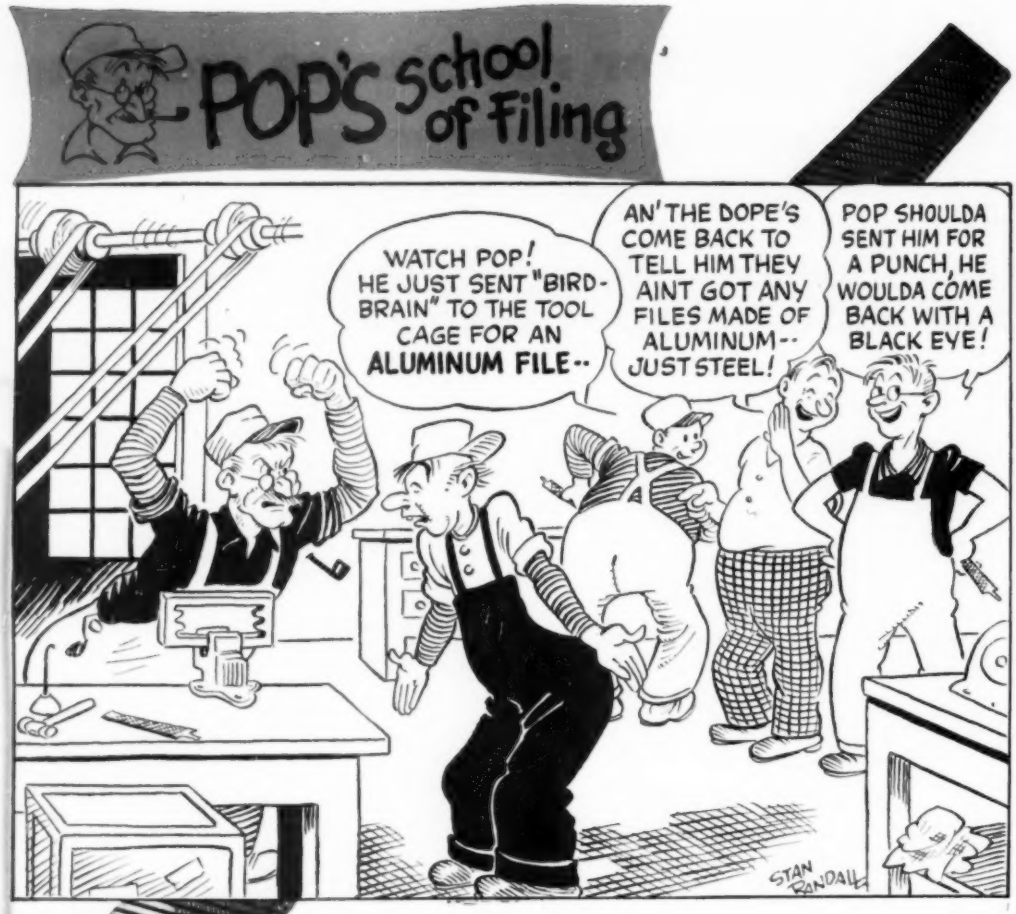
Please send me supplement No. 1 Bulletin GEA-4726 on Nonsynchronous Welding Control.....

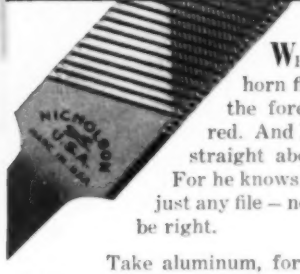
I would like a showing of "This is Resistance Welding".....

NAME.....

ADDRESS.....

.....


POP'S school of filing
WATCH POP! HE JUST SENT "BIRD-BRAIN" TO THE TOOL CAGE FOR AN ALUMINUM FILE--
AN' THE DOPE'S COME BACK TO TELL HIM THEY AINT GOT ANY FILES MADE OF ALUMINUM-- JUST STEEL!
POP SHOULDA SENT HIM FOR A PUNCH, HE WOULDA COME BACK WITH A BLACK EYE!
STAN RANDALL



WHEN the shop greenhorn flubs one on files, Pop the foreman is sure to see red. And Pop's sure to set him straight about "the *right* file." For he knows it doesn't pay to use just any file – not when the job must be right.

Take aluminum, for example. It's soft, ductile and malleable. Clogs the teeth of ordinary files – even when moderate pressure is used.

The *right* file is the Nicholson or Black Diamond Aluminum "Type A" File. Its special teeth break up the filings, help clear the file, reduce chatter and prevent taking too large a bite. Cuts rapidly yet leaves a good finish.

This is one of many cases where Nicholson special-purpose files can help increase output, not only by saving workers' time, but by reducing costly rejects and reworks! Send for the Nicholson pamphlet, *"Ten Special File Types,"* and for the new edition of *"File Filosophy."* They're FREE.

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

Announcing

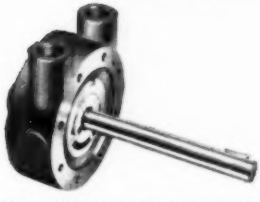
A NEW SERIES OF

AUTOMATIC REVERSING VANE PUMPS

Nos. 8021, 8061, 8101 — and

Stripped Models with Housings

Stripped Models without Housings



Stripped Models with Housings, Nos. 8022, 8062 and 8102. Simplify installation, particularly where internal discharge and suction ports are not readily incorporated in the machine design, or where outside piping is desirable.

Stripped Models without Housings, Nos. 8023, 8063 and 8103. Made for manufacturers who wish to utilize pumps as integral parts of machines with suction and discharge ports incorporated in the machine castings. Provides compact installation... minimum projection from machine surfaces.

Many important and convenient features have been designed into this New Series of Brown & Sharpe Pumps for lubrication and coolant systems on machines that reverse. Heading the list is the fully-automatic reversing feature with unidirectional flow. Other features include... three sizes—2½, 5 and 11½ gpm at 0 pressure, max. speed 1140 R.P.M.... easy changeability of flow direction from one port to the other, in the field... mounting design that permits foot to be set in 4 different positions with ports held vertical.

For integral mounting, each size pump is furnished also as a stripped model *with* housing, or stripped model *without* housing. Easily installed with minimum number of machining operations. Complete information available in new Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE PUMPS B·S

ARMSTRONG

ARMSTRONG TOOL HOLDERS

are more efficient

It takes years of development, improvement and practical experience to create and perfect a line of tools. This has been the specialized work of ARMSTRONG, a contribution to machining efficiency which they have carried on continuously for 59 years.

Starting with the Armstrong Principle of inserted cutters in permanent tool shanks that "Saves: all Forging, 70% Grinding and 90% High Speed Steel," they created this unique method of tooling which has changed shop practice in over 96% of the machine shops and tool rooms. And, today, in a specially built plant, equipped with every modern facility and staffed with experts in each phase of tool making, this work goes on.

To you, as a tool user, here is always one safe principle—specify ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers, for turret lathes and screw machines. They are cataloged and stocked by all leading supply houses.

Write for the New S-48 Catalog just released

ARMSTRONG BROS. TOOL CO.

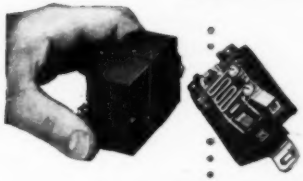
"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U.S.A.

Eastern Whse. & Sales Office: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, California

INCREASED VALUE

no increase in price

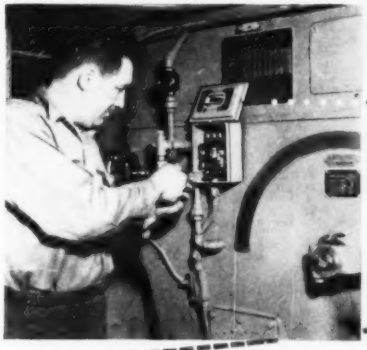


manual motor starters...

. . . . feature quick, easy installation; positive overload protection with long-life bi-metallic relays; easy wiring and servicing because terminals are wired from the front. Application—fractional and integral motors up to 7½ horsepower.

The CR1061 controls a handkerchief ironer in a modern laundry.

The CR1062 is easy to mount and wire. Used here on a coolant pump.



Roomy, attractive case can be mounted on or beside the machine. Sturdy switch mechanism resists vibration. New push-button as well as toggle-type forms now available for integral motor starting. All forms—watertight, dust-tight, and explosion-proof—available in both lines. Write now for more information. *Remember, these new starters have all the features you've been wanting at no increase in price.*

General Electric Company
Apparatus Dept., Sec. F730-9
Schenectady 5, N. Y.

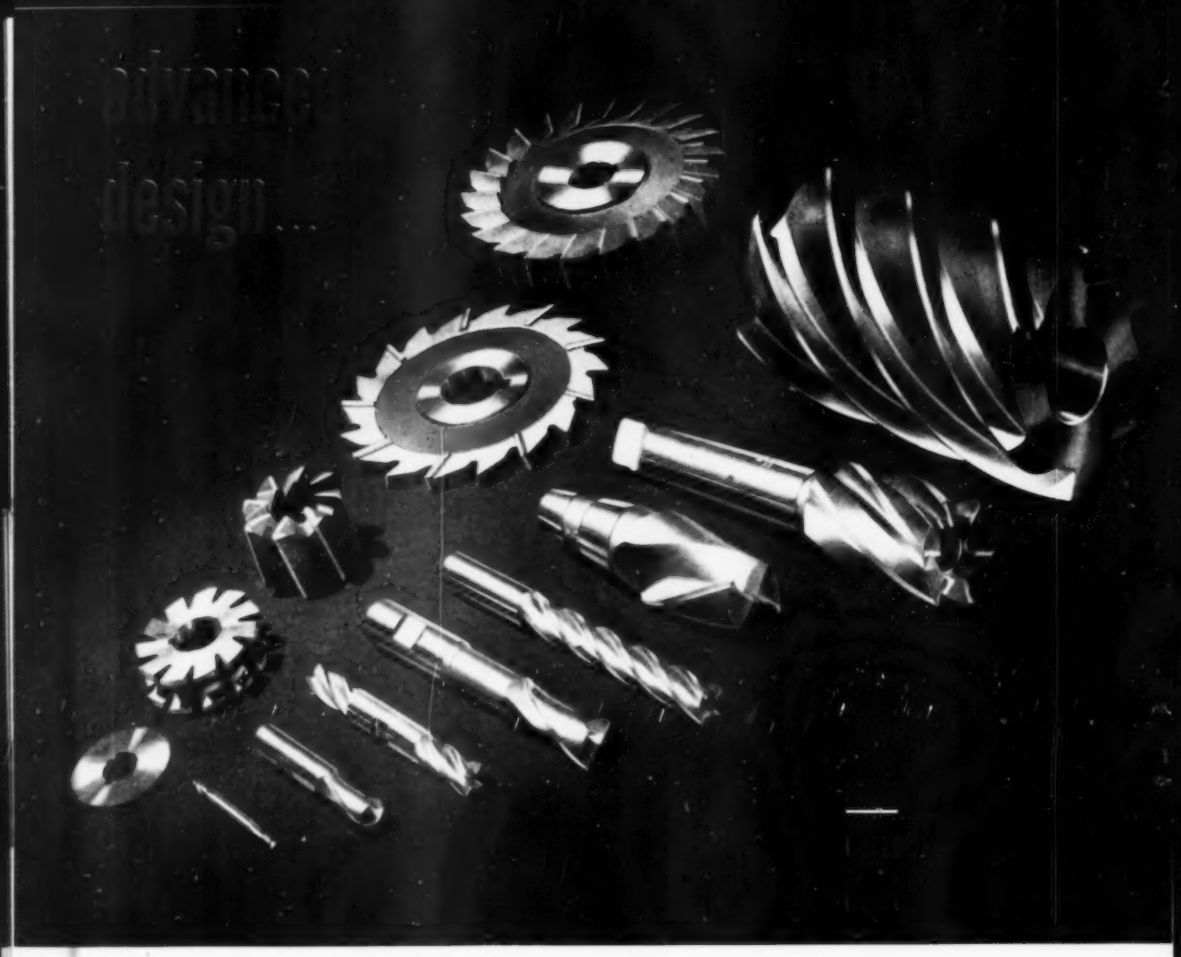
Please send me—
Bulletin GEA-2234E on CR1061 Fractional-hp Motor Starters
Bulletin GEA-1522F on CR1062 Integral Motor Starters

NAME _____

COMPANY _____

ADDRESS _____

GENERAL ELECTRIC



To help you take full advantage of more efficient machines and new materials, Brown & Sharpe engineers are constantly testing and developing new designs in cutters. In the development of the most practical cutters, diversified manufacturing in Brown & Sharpe's own plant provides an exhaustive testing ground.

Brown & Sharpe cutters have many advanced features of design that permit highly efficient operation. Their dependable performance assures *more* as well as *better* work.

Get fully acquainted with all the advantages of Brown & Sharpe cutters—they cost you less in the long run. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

• A COMPLETE LINE OF MILLING CUTTERS

Plain Milling
Helical Plain Milling
Side Milling
Staggered Tooth Side Milling
Inserted Tooth
Angular
Convex and Concave
Screw Slotting
Sprocket Wheel
Gear
End Mills
Metal Slitting Saws

We urge buying through the Distributor

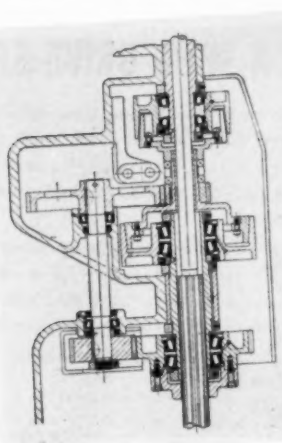
BROWN & SHARPE CUTTERS B·S

Keeps precision on tap with the help of TIMKEN® bearings

ACCURATE automatic tapping up to 3" diameter taps, elimination of chatter, and continuous trouble-free operation are advantages of this Garvin Hi-Power Tapper, made by the Western Machine Tool Works, Holland, Michigan. And the manufacturers give full credit for its outstanding performance to Timken® tapered roller bearings, used throughout the machine!

Timken bearings hold the spindle in rigid alignment—keep it revolving accurately under the heaviest loads. The line contact between the rolls and races gives the spindle maximum support—no chance of deflection. And due to their tapered construction, Timken bearings take both radial and thrust loads—in any combination. In the gear box, Timken bearings keep all other shafts accurately positioned. Gears mesh perfectly. Smooth, frictionless operation results in maximum power transmission for high speed production.

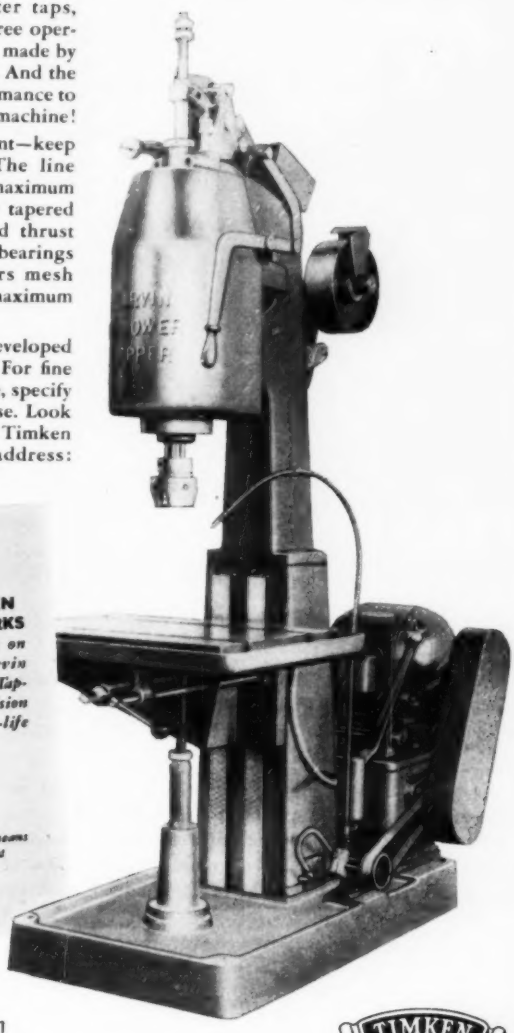
Timken bearings are made of the best steel ever developed for tapered roller bearings—Timken fine alloy steel. For fine bearing performance throughout the life of the machine, specify Timken bearings on all the equipment you make or use. Look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".



Here's how **WESTERN MACHINE TOOL WORKS** *uses Timken bearings on the spindle of the Garvin "Hi-Power" Automatic Tapper—for greater precision and dependable long-life operation.*

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best



NEW TIMKEN BEARING CUTS RUN-OUT IN HALF!

Until now, the Timken "Zero" bearing has been the last word in bearing accuracy. Now Timken offers industry the "Double-Zero" bearing—*twice as accurate* as the "Zero"! Maximum run-out of the new "Double-Zero" bearing is only 75 millionths of an inch—*half* the 150 millionths run-out of the "Zero" bearing.

What an opportunity for manufacturers of machines where extreme accuracy is essential! Available in standard single row types, up to 10" O.D. Write for further nformation.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

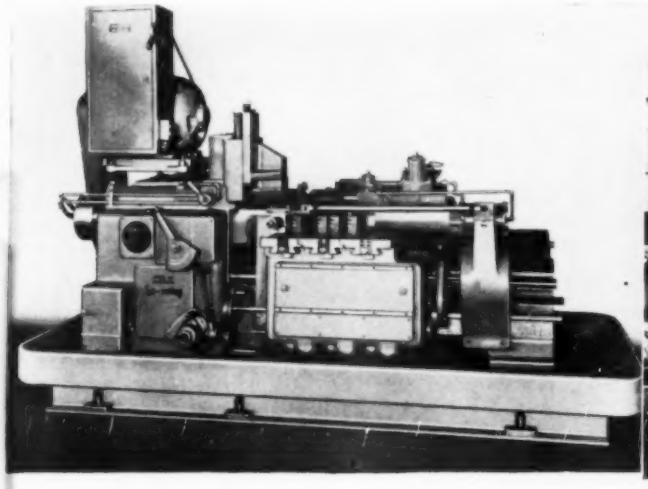
TAPERED ROLLER BEARINGS

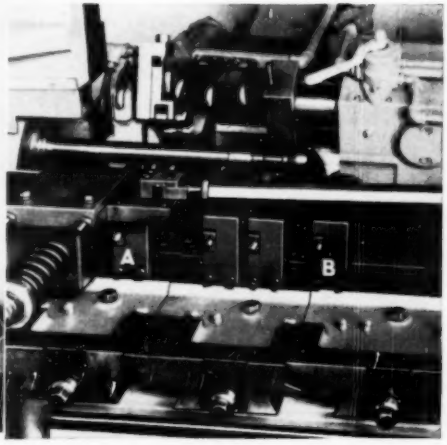
TIMKEN 1899 50 1949 YEARS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ⟨⟩ AND THRUST →⟨⟩← LOADS OR ANY COMBINATION ⟨⟩←

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





MODEL "AR" Lo-swing SLASHES COSTS ON MAIN DRIVE SHAFT

Problem: To offset high labor costs by increased production on Main Drive Shaft.

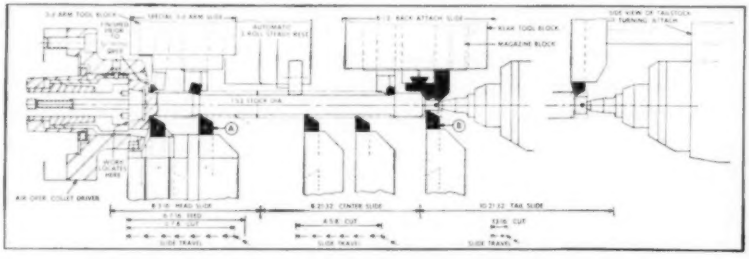
Solution: The Model "AR" Automatic Lo-swing Lathe was selected for this job because it had sufficient weight and rigidity to insure long tool life at high cutting speeds with sintered carbide tools.

Shafts are delivered to the Lathe with the gear end finished to size and the small end centered. The line drawing shows a cross section of the collet chuck which centers and drives the shaft on the gear end. This method of driving increased the rigidity of the shaft. The three-roll steady rest is automatically operated, the rolls being advanced to contact the shaft as soon as tool "A" turns a spotting wide enough to clear the rolls. Tool "A" is the only tool cutting until the steady rest rolls support the piece, after which all the other tools start cutting simultaneously.

Another feature on this machine is the Automatic Tailstock Turning Attachment, shown in the close-up illustration, which is used to rough turn the small end of the shaft ahead of tool "B" which finish turns. This small diameter is held within close limits by this method and a green grind operation is eliminated.

The complete cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button. All tools are carbide. Material is SAE 5140 steel forging and the machine cycle time is 30 seconds.

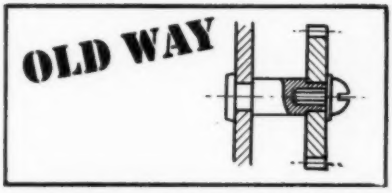
If you want lower production costs, let us help you with your turning problems.



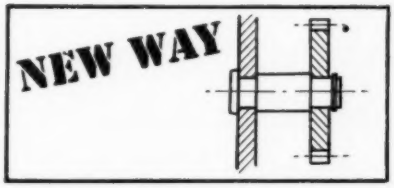
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

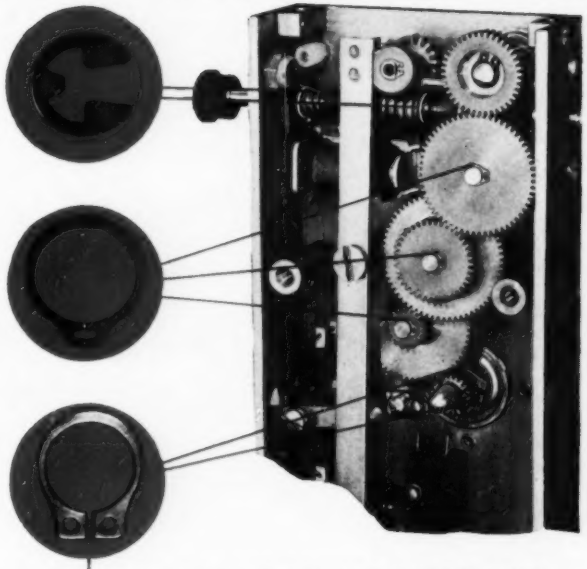
Redesign with TRUARC cuts unit cost 42¢ saves 7½ minutes assembly time



SCREW AND WASHER HOLD FLOATING GEAR IN PLACE in old model newspaper facsimile recorder. Gear stud may rotate at pivoted end, making removal of screw difficult. Screw head takes up valuable space.



TRUARC RING REPLACES SCREW AND WASHER in this typical application. Truarc Ring saves space, makes assembly-disassembly quicker and easier. No screw slots to get burred up.



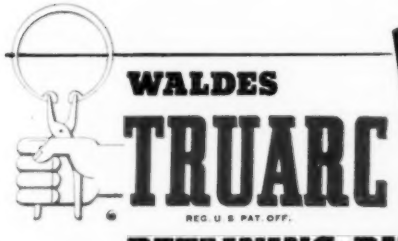
Not only do 22 Truarc Rings save time and money in production for Times Facsimile Corporation, New York. They also make maintenance easier and faster—a basic advantage in a machine on duty 24 hours a day.

Redesign with Truarc Rings and you too will save! Wherever you use machined shoulders, nuts, bolts, screws, snap rings, cotter pins, there's a Truarc Ring that does a better job of holding parts together.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention without obligation.

22 WALDES TRUARC RINGS GIVE THESE BIG ADVANTAGES:

- ½ inch space saving permits money-saving use of standard relay rack.
- 7½ minutes assembly time saving.
- 42¢ overall unit cost saving.
- Replace tapping with simple grooving operation.
- Speed maintenance because Truarc Rings are easy to assemble and disassemble... can be used over and over again.



WALDES

TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,382,548, 2,416,852, 2,420,921, 2,411,761 AND OTHER PATS. PEND.

AM-12

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, N. Y.

Please send 28-page Data Book on Waldes Truarc Retaining Rings.

Name_____

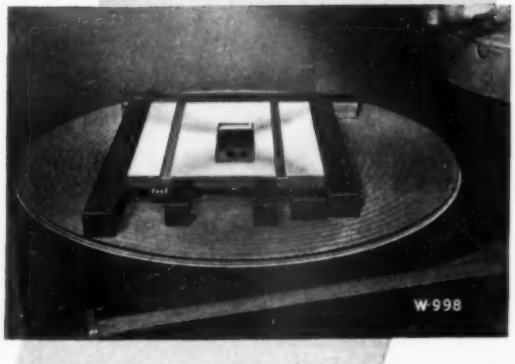
Title_____

Company_____

Business Address_____

City_____ Zone____ State_____ ★

Put it on the Blanchard



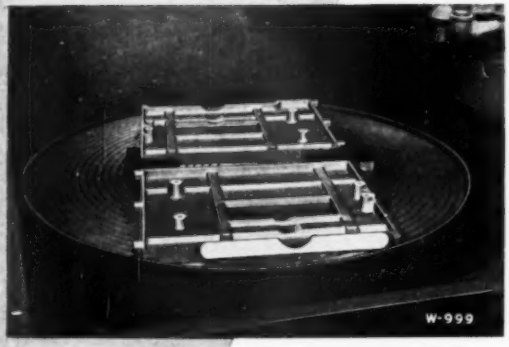
Material: Aluminum Castings

Size: 14⅛" x 18"

Held on 36" magnetic chuck on the No. 18 Blanchard Surface Grinder by means of suitable steel or cast iron blocking pieces.

Proper finishing of these aluminum saw table castings required the removal of 1/16" of metal from both sides, to a flatness of .004". The job was put on the Blanchard No. 18 surface grinder in two operation sequences. The broad side is ground first —*to a flatness of .002"*. The flatness and finish of the Blanchard ground surfaces are such that no other finishing or corrective operation is necessary.

They asked for flatness of .004"—They got .002"

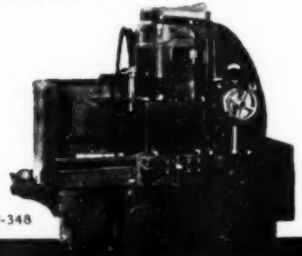


The second operation permits two pieces being laid flat on the chuck, securely held and thus the reverse side is ground to the same flatness limits.

The rate of production is 8½ pieces (17 surfaces) per hour, 8½ of the surfaces being broad and 8½ being narrow or ribbed.

The Blanchard Grinding of these aluminum saw tables was the most economical way to produce smooth flat surfaces and meet customers' limits. In this case Blanchard beat the limits asked for by customer. If the surface must be flat and parallel bring it to the Blanchard for best results.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



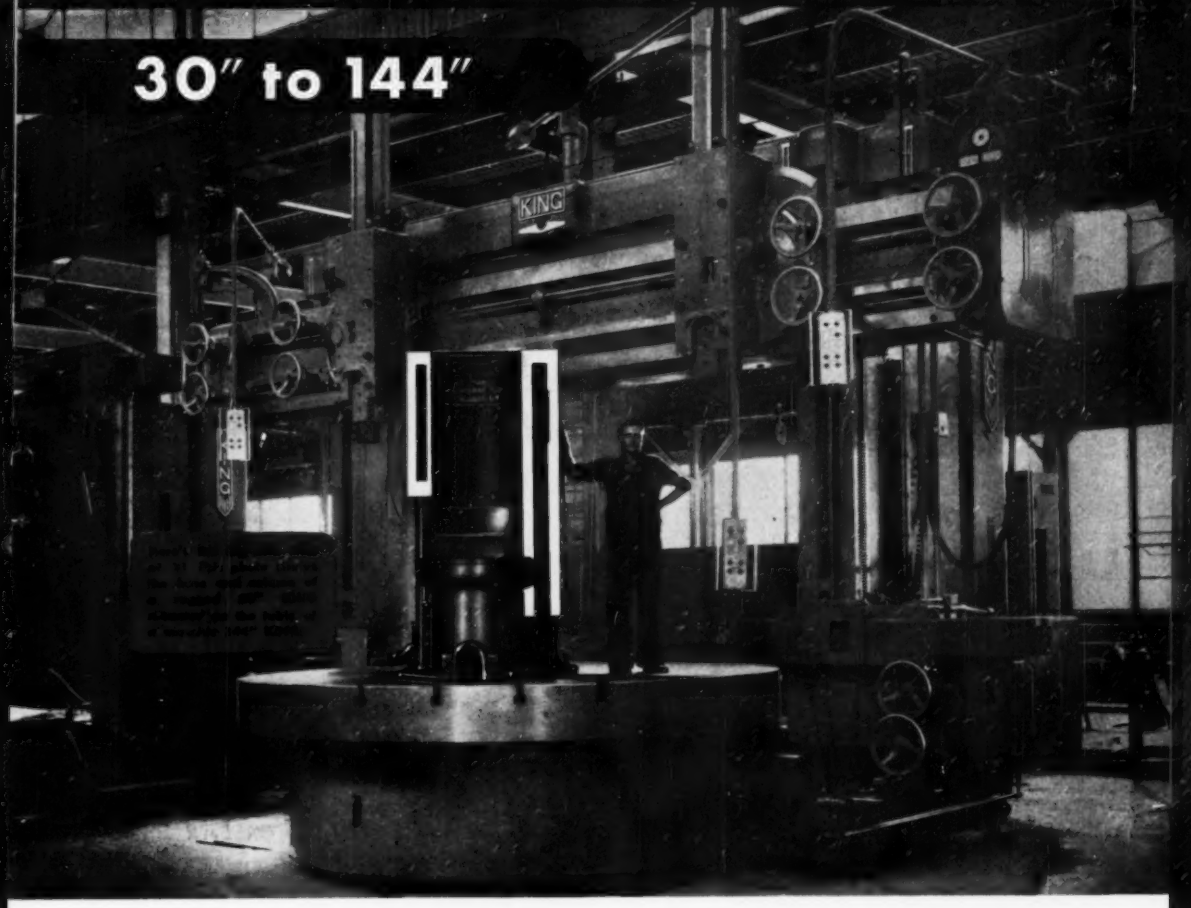
BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

KING Makes the Widest Range

30" to 144"



The KING line of Vertical Boring and Turning Machines is not just a "large size" or a "small size" line. It's an all size line. KING and *only* KING "covers the field", with 10 sizes: 30" and 36", one head on rail—42", 52", 62", 72", 84", 100", 120", and 144", one or two heads on rail. All sizes are available in a variety of head combinations, with or without side head.

KING has the size range—and KING has the extra weight and rigidity, the speeds, the power, the time-saving ease of control that adds up to *more work and better work at less cost.* Get the facts. Write today for catalog giving detailed information. Specify the size machines that meet your job requirements.

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

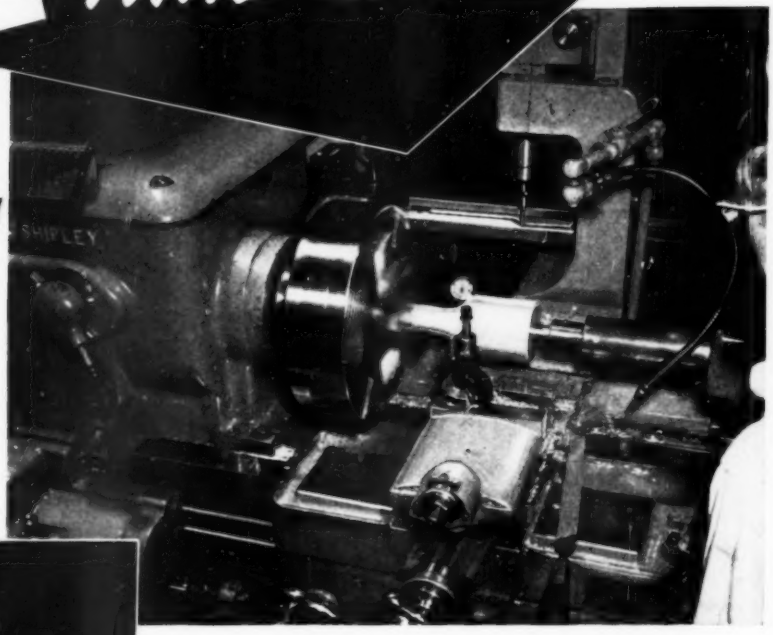
50% TIME SAVED

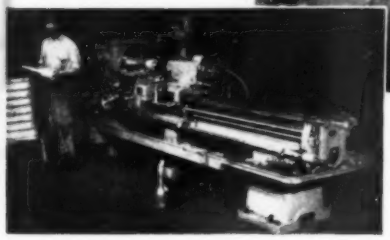
...with

LODGE & SHIPLEY COPYMATIC

over other Lathes!

says Wyman-Gordon Company
WORCESTER, MASS.





DUPLICATE PARTS OR DO REGULAR LATHE WORK . . . get instant changeover ONLY with the COPYMATIC

Wyman-Gordon Company is in an ideal position to analyze the performance of high production lathes. That's why their comment on the performance of Lodge & Shipley COPYMATIC Lathes is highly significant.

High accuracy, plus "better versatility" and "better output" gives this firm a time saving of "50% over other lathes." In the illustration, the COPYMATIC is contour machining aluminum extrusions, using a flat template for automatic duplication.

Where conditions do not warrant the making of a flat template, the first piece of a lot can be machined by standard lathe operation, then used as a template for the remainder of the lot. Features such as these, combined with the versatility of the Lodge & Shipley Model "X", give "special machine" high production rates without the usual cost.

The COPYMATIC can be a profitable producer in your shop. Ask your Lodge & Shipley Representative for additional details or write for Bulletin No. 675.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

BARDONS & OLIVER, Inc. ANNOUNCES

A BRAND NEW ROLLER CUTTER TYPE PIPE NIPPLE MACHINE . . . chamfers both ends for threading and cuts off—up to 100 OR MORE NIPPLES PER MINUTE!

. . . why consider a 4 to 8 spindle machine when this SIMPLE and INEXPENSIVE single-spindle machine will produce as many pieces or even more?

DEVELOPED SPECIFICALLY FOR *Highest Production of Pipe Nipples*—

"Also highly productive for many similar parts made from pipe or tubing."

FROM ⅜" SIZE

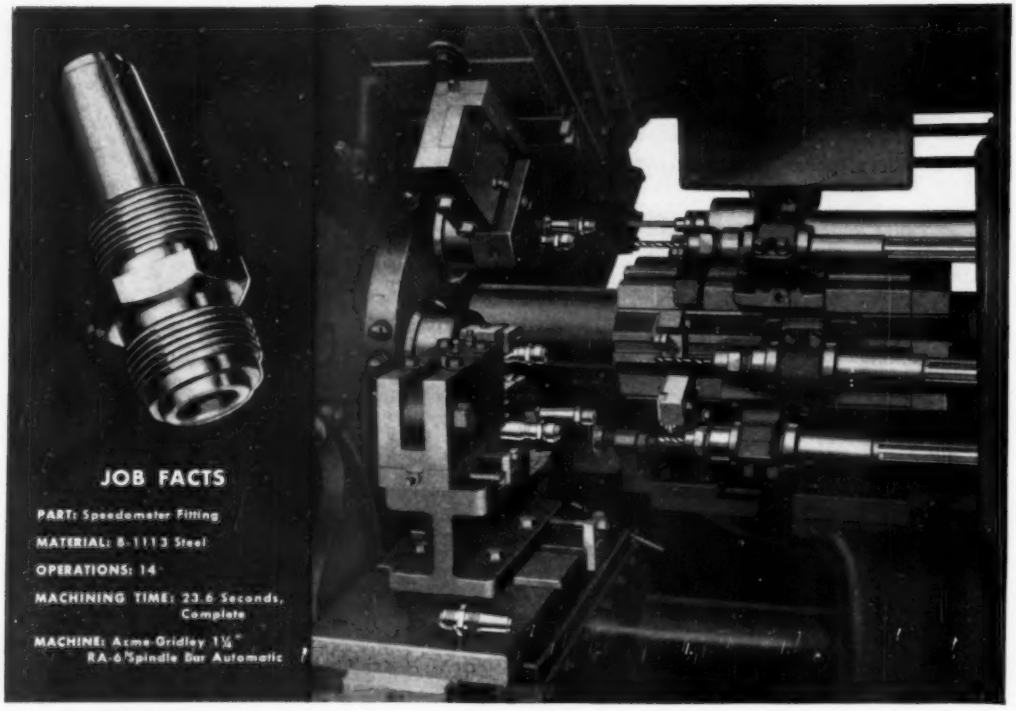
TO 1½" SIZE

COMBINES ALL OUTSTANDING ADVANTAGES OF BOTH THE ROLLER CUTTING PRINCIPLE AND ALSO THE POWER DRIVEN REVOLVING SPINDLE IN A SINGLE MACHINE

1. Roller Cutter eliminates all cutting waste, thus producing the maximum number of Nipples from a given length of pipe.
2. Power Driven Revolving Spindle lengthens Roller Cutter life, producing 5,000 to 10,000 or more Nipples before resharpening is necessary.
3. Overall lengths of Nipples are consistently held within tolerance of a few thousandths of an inch, without any slowdown in production.
4. Cut off and chamfered ends of nipples are accurate and true running, with smooth finish.

For Further Information, Please Consult

BARDONS & OLIVER, INC. 1133 WEST 9TH STREET CLEVELAND 13, OHIO



COST-CUTTING COMBINATION:

—One Machine Instead of Two
—Output Increased 16%

Fourteen operations in 23.6 seconds! That's the kind of timesaving production you get on modern Acme-Gridley Automatic bar machines.

You'll make other savings, too—in machines, man hours and overhead. Acme-Gridleys are designed to take a wide variety of cut-combining, power-driven auxiliaries that "up" production per machine.

Take the job illustrated: the fourteen required operations formerly were done on two machines, the first seven on one, the remainder on the second. By arranging the tooling to include rolling the smaller of the two threads, the piece is now finished *on one machine* (a modern Acme-Gridley Automatic) and at a gain in output of 16%.

The particular job may not be applicable in your shop *but the basic principle—that Acme-Gridleys cut costs—is.* May we show you how—in terms of your own specific metal-turning needs—either bar or chucking work?

The NATIONAL ACME CO.

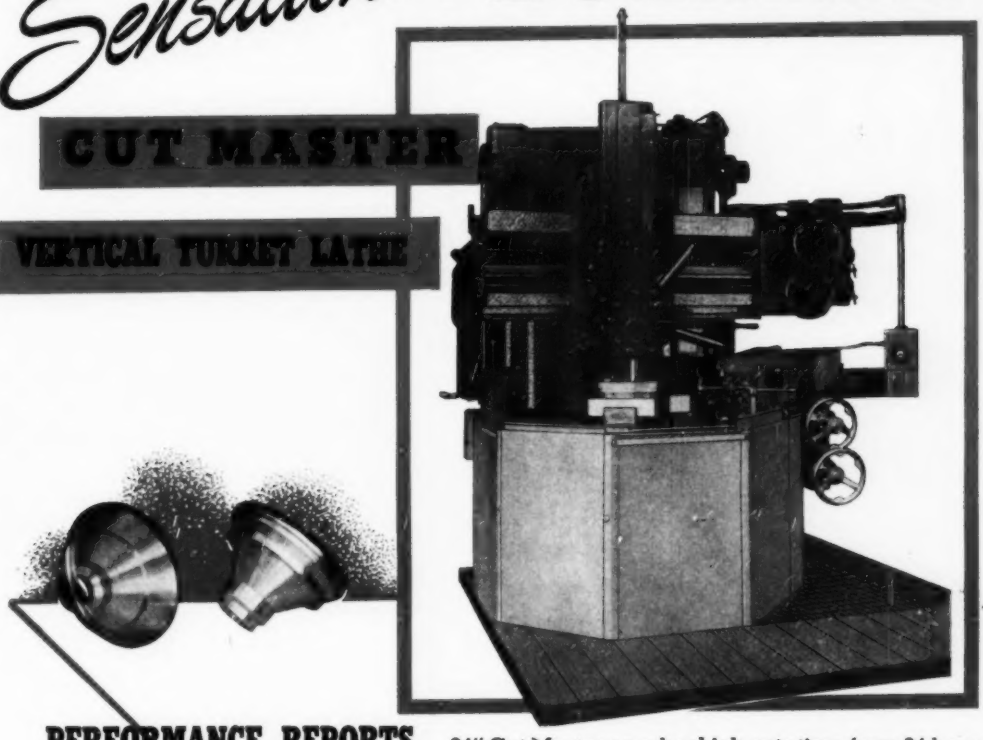
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

The Sensational BULLARD

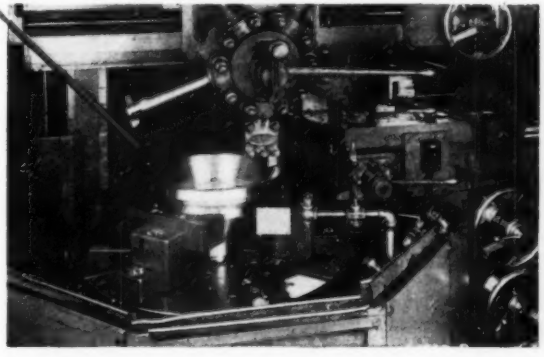
CUT MASTER

VERTICAL TURRET LATHE



PERFORMANCE REPORTS... 64" Cut Master on wheel job cuts time from 24 hours to 7 hours. — A new method of tooling and the speeds available on a 42" Cut Master cut floor to floor time from 1 hr. 50 minutes to 38 minutes. — Another 42" Cut Master cut job time from 1 hour 40 minutes to 23 minutes. — and yet another 42" machine improves over former method on endshields. Previously 1 piece required 1 hour 40 minutes. Now two shields are completed every 40 minutes. Let Bullard figure your jobs on Cut Master Vertical Turret Lathes. **The Bullard Company, Bridgeport 2, Connecticut.**

BULLARD



In 3 chuckings, 380 lbs. of stock was removed in 14¼ hours from a stainless steel forging of this bowl shell. Such an excellent finish was obtained, that a previous polishing operation was eliminated.

Be smart about your business . . . demand uniforms of

REEVES QUALITY FABRICS

Beyond compare for smart good looks and longer wear, Reeves Fabrics have what it takes to stand up under the punishment of repeated launderings . . . and still look fresh and crisp. For these Reeves Fabrics are made from carefully selected long-staple cotton . . . combed . . . Sanforized* . . . and vat-dyed in colors that are fast to sun, water and perspiration.

You benefit three ways. Smart looking uniforms boost employee morale...increase customer good will. Longer-wearing uniforms mean greater savings because they spread first costs.

Look for the Reeves Fabric Label—it's your sign of uniforms and work clothes that "mean business." Write today for complete information concerning your industry.

*Residual shrinkage less than 1%

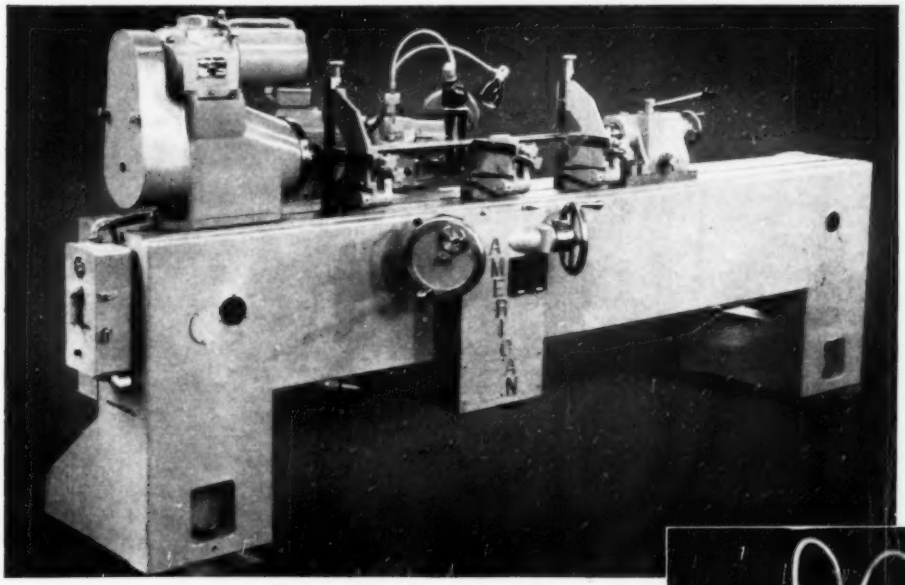
"FROM COTTON TO CUTTER"

REEVES BROTHERS, INC.

54 WORTH STREET, NEW YORK 13, N. Y.

REPRESENTATIVES IN: *Akron • Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • Portland, Oregon • St. Louis • Montreal • Toronto*

• Fixed Broach • Traveling Wheel . . . the *American* way to Better Broach Resharpening



The NEW *American* ROUND BROACH SHARPENER

Can Give You These Advantages

- **Time Saved Through Faster Resharpening**
- **Money Saved By Fewer Resharpenings**
- **Part Cost Lowered By Better Resharpening**

The new American Round Broach Sharpener is designed to make possible fast, highly accurate broach resharpening in your own plant. It is speedy, efficient, needs no highly skilled operator.

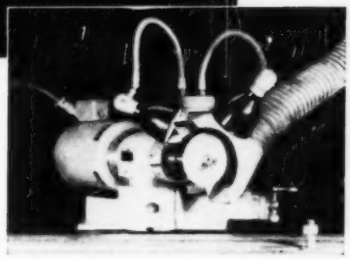
American designed the new RBS to overcome broach vibration which results in an inferior job. **The broach is rotated between fixed centers, while the carriage mounted grinding spindle is traversed from tooth to tooth.**

Here's what you get with this NEW idea:

1. The broach is supported above and between the pedestals. It never extends beyond the bed. This solid support minimizes vibration, improves resharpening. 2. Machine is more durable because there is less wear on vital ways with the ball-bearing mounted carriage always in full contact — never extended. 3. Resharpening is faster, and more accurate because efficient design relieves operator from mental and physical fatigue. 4. Minimum floor space required because no traveling members extend beyond the bed length.

The RBS has been thoroughly tested, for over a year in actual use, in the plant of one of the largest users of broaching in the country. It has proven highly successful. It saves time in broach sharpening, and gives a better sharpening job.

The American Round Broach Sharpener is now available in two models to sharpen cylindrical broaches up to either 60" or 84" in length and up to 9" in diameter.



Model RSB9-84. Insert shows grinding spindle.

FEATURES of the *American* Round Broach Sharpener

- Sturdy Construction
- Heavy Ribbed Cast Iron Bed and Pedestals
- Full Between Pedestal Support
- Simple Manual Control
- All Controls Mounted on Carriage
- Cast Aluminum Carriage Ball Bearing Mounted on Hardened and Ground Rails
- Micrometer Dial and Rapid Traverse Lockout on Left Handwheel
- Right Handwheel Controls Infeed
- Variable speed (100-500 RPM) Transmission
- Graduated Face Plate
- Quick Release Variable Tension Spring Loaded Tailstock

Write for complete informative Circular No. 800. Please address Department A.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Shop Set MTT . . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $100.00.
Economy Set MT . . . . Over 5000 combinations in thousandths. Price in mahogany case, $40.00.
Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5" and 6" Microgages. Price in mahogany case, $60.00.
Toolmakers Set M64 . . . Gives 121 combinations in 10ths, 32nds and 64ths. Price in mahogany case, $17.50.

The New Van Keuren

7/8" DIAMETER MICROGAGES are the best buy . . . . . .

60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

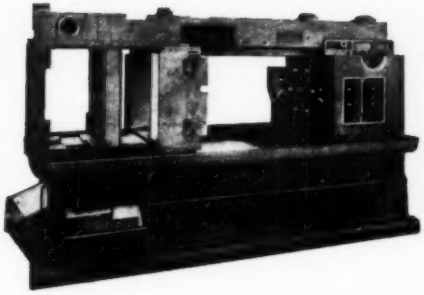
Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

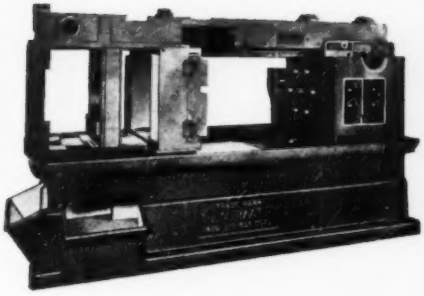
THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



2⅝" 6-Spindle
CONOMATIC
FRAME



Heavy, Massive

ARE YOU

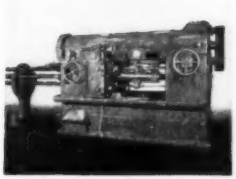
Weight — 12,446 pounds
Floor Length — 127"
Floor Width — 50"
Height — 71 11/16"
Height of Base Support—34"
(Full information available)

SUBJECT TO WITHHOLDING?

The withholding of information regarding the facilities of machine tools would be unintentional. But the use of generalizations and approximations, instead of specifications, actually is withholding. Generalizations fail to establish the superiority of a machine's facility through terms which lack a definite basis of comparison. They leave an impression of doubt as to tangible substantiation.

There is nothing definite about a "roomy" tooling area; nothing specific about a "rugged" tool slide, and nothing comparative about a "massive" frame.

The dispensing of machine information is the responsibility of the manufacturer. Realizing this, CONE has prepared an analysis chart that should prove very useful to those seeking more specific information about multiple spindle automatic bar machines. Your copy is free. There is no obligation.



A comparison with ALL Automatics
will lead you to

Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
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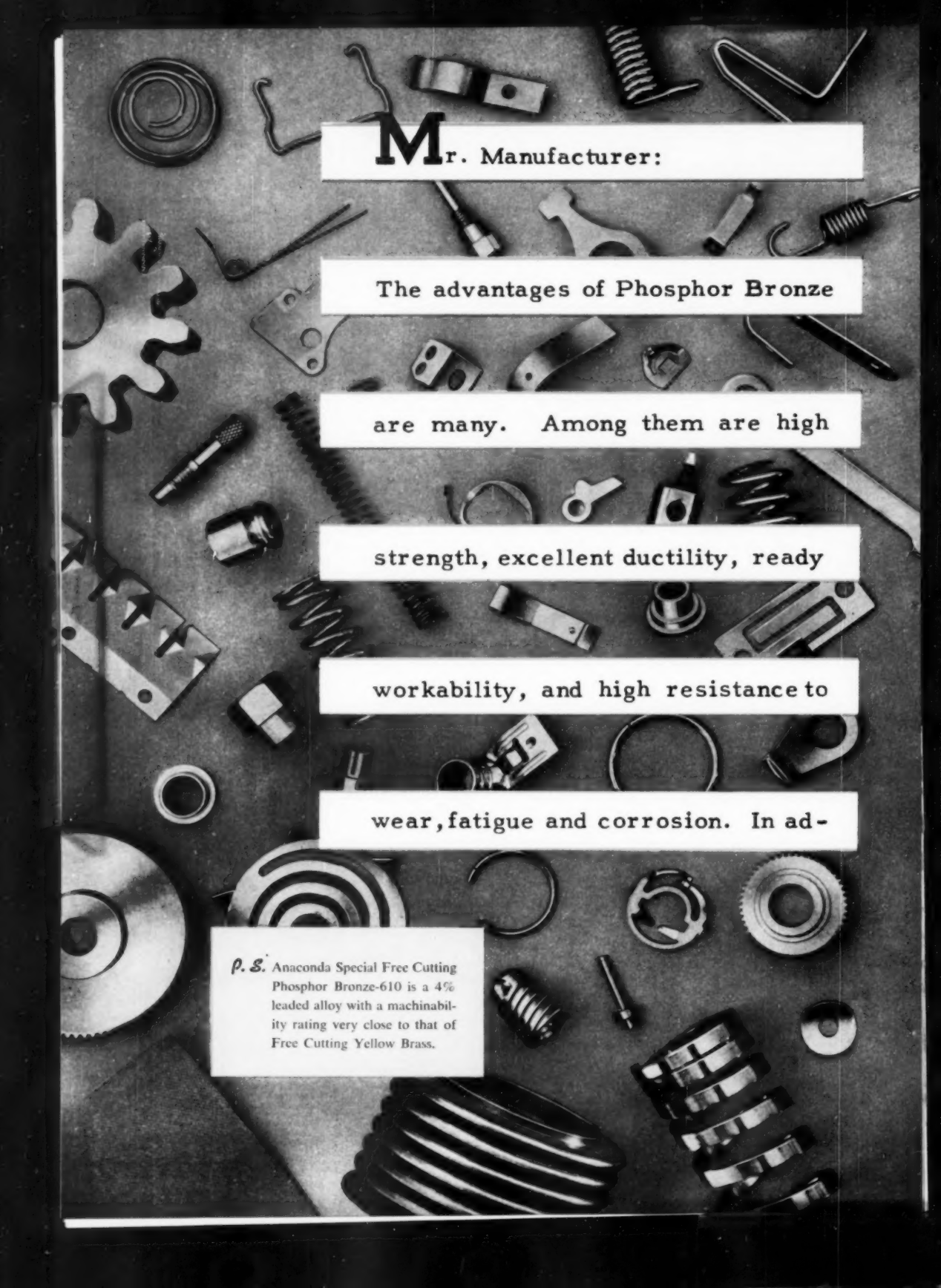
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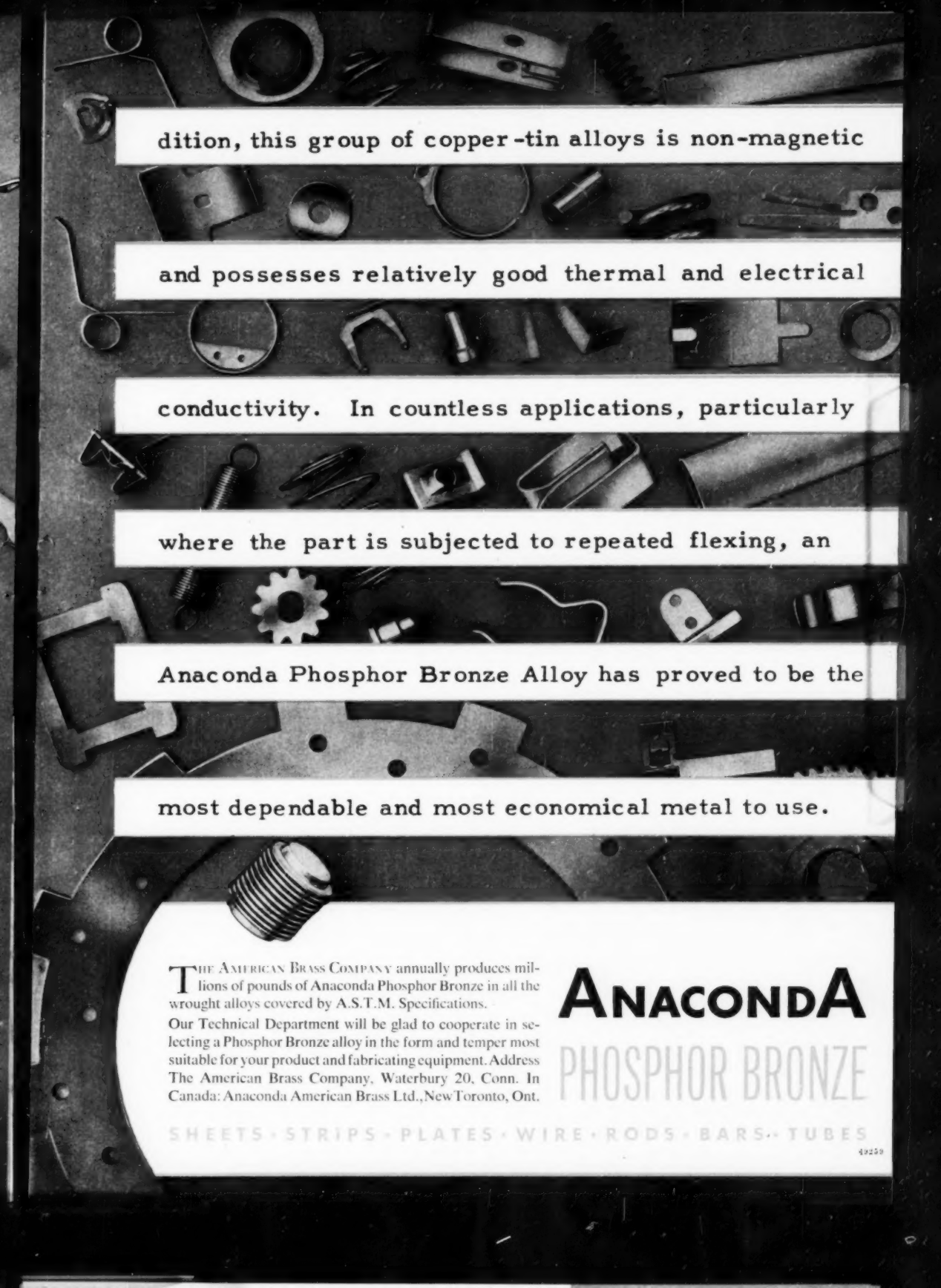
The advantages of Phosphor Bronze
are many. Among them are high
strength, excellent ductility, ready
workability, and high resistance to
wear, fatigue and corrosion. In ad-
P. S. Anaconda Special Free Cutting Phosphor Bronze-610 is a 4% leaded alloy with a machinability rating very close to that of Free Cutting Yellow Brass.


dition, this group of copper-tin alloys is non-magnetic
and possesses relatively good thermal and electrical
conductivity. In countless applications, particularly
where the part is subjected to repeated flexing, an
Anaconda Phosphor Bronze Alloy has proved to be the
most dependable and most economical metal to use.
THE AMERICAN BRASS COMPANY annually produces millions of pounds of Anaconda Phosphor Bronze in all the wrought alloys covered by A.S.T.M. Specifications.
Our Technical Department will be glad to cooperate in selecting a Phosphor Bronze alloy in the form and temper most suitable for your product and fabricating equipment. Address The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.
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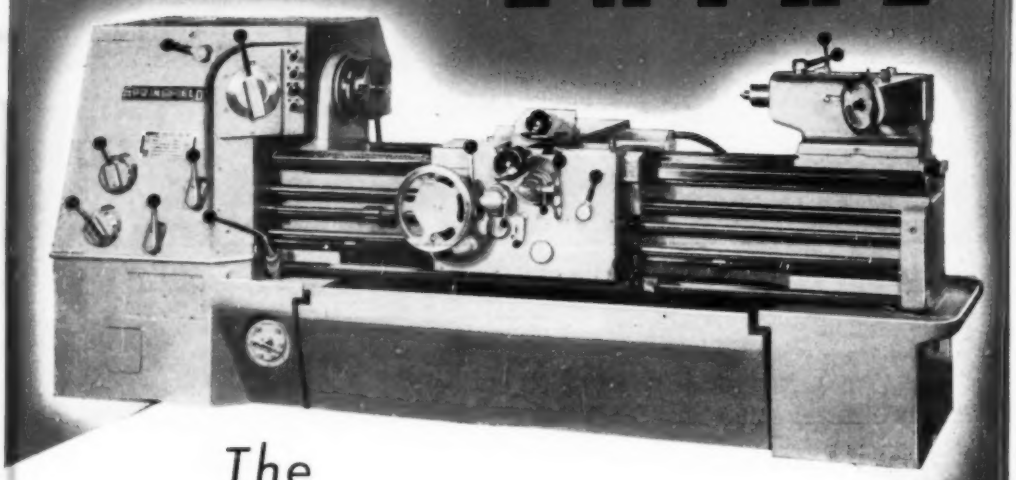
49259

New SPRINGFIELD Model S LATHE



The "World's Best Investment" in Lathes

NEW engineering designs give greater precision, rigidity and production capacity.

NEW control applications result in greater operating ease and efficiency.

NEW combinations of modern lubrication methods combat wear and reduce operating costs.

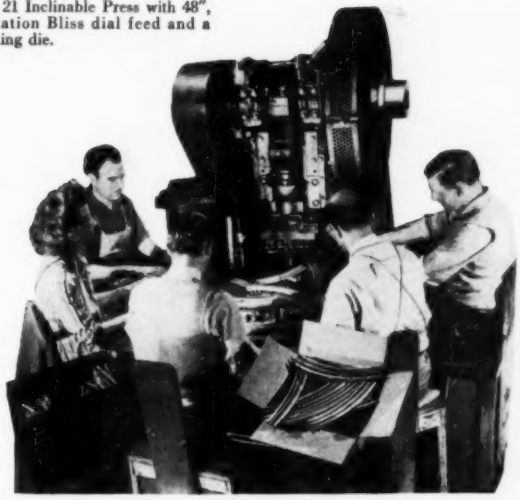
THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

Rails and ties for Lionel electric toy trains are assembled at the rate of 1250 per hour in this Bliss No. 21 Inclinable Press with 48", 8-Station Bliss dial feed and a staking die.



Why Bliss Inclinable Presses Outsell All Other Makes

AND WHY IT'S THE PRESS FOR YOU

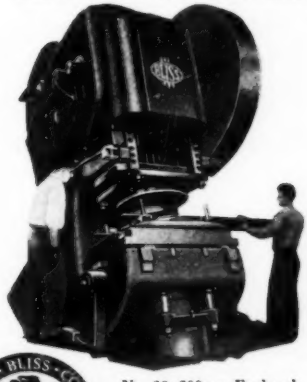
Look "inside" a Bliss inclinable press and you'll understand why it's preferred by press users everywhere...why there are more than 100,000 in use.

At the right are the reasons—plus the fact that they are priced right—most often reported to us by the trade for this overwhelming preference. They add up to ruggedness and almost indestructible precision.

If your pressed-metal production calls for inclinables, you're sure to find the answer among Bliss' wide range of standard sizes. You'll make the right choice, too, because "BLISS" on your press is more than a name...it's a guarantee!

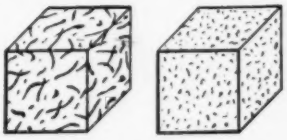
E. W. BLISS COMPANY, TOLEDO 7, OHIO

MECHANICAL AND HYDRAULIC PRESSES, ROLLING MILLS, CONTAINER MACHINERY

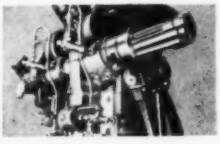


No. 30, 200-ton Enclosed Inclinable Press.

A NEW INCLINABLE PRESS CATALOG, 2-C, IS JUST OFF THE PRESS. Write for it today, as well as for Service Sheet A-105, which gives operating and maintenance instructions.



FRAME. Strong and durable press frames of high tensile Meehanite castings. Three-dimensional drawings show distribution of graphite in ordinary cast-iron (left) as compared with controlled graphite structure of Meehanite castings (right) used in Bliss presses.



CLUTCH. Bliss patented Rolling Key Clutch, universally called the finest positive clutch available on any press. Note location of clutch keys near shaft center. This means slower-moving points of engagement, faster operating speeds, less shock during intermittent operation and longer life to all moving parts.

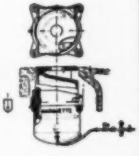
CONNECTIONS. Solid, plug-clamp connection strap, which gives full 360° bearing against slide adjusting screw. This arrangement also permits using V-thread on screw, making replacement easy.

SLIDE ASSEMBLY.

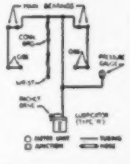
Slides are accurately gibbed to insure precise registry of die and punch. Ball seat is renewable, as are split bronze ball-cap bushings and laminated shim against which ball-cap is brought down by four bolts to give correct clearance for proper lubrication and fit.

BEARINGS, WAYS AND GIBS. Main shaft bearings and connection bearings are bronze bushed. Roller bearings are standard for drive shaft bearings on large geared presses. All wearing surfaces are especially finished to insure long life.

CUSHIONS. Every Bliss Inclinable Press is designed and machined to accommodate the Bliss Marquette die cushions which extend the press application to drawing operations.



LUBRICATION. Bliss Inclinables have floor-line lubrication systems with oil or grease fittings at main points of moving contact. All standard Bliss Inclinable frames are machined to take Bijur one-shot pressure system.



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BLISS BUILT

Bliss Builds More Types and Sizes of Presses Than Any Other Company in the World

The extreme hardness of Norbide abrasive is bringing increased efficiency to the lapping of cemented carbides and other hard materials. Norbide abrasive approaches the diamond in hardness and yet costs only 1/100th to 1/150th as much as diamond powder. It is successfully used in the lapping of hard materials where other manufactured abrasives do not remove stock quickly enough for economical production. Norbide abrasive is stocked by all Norton distributors. For further information and prices, write for free bulletin No. 559.

NORTON

NORTON COMPANY
WORCESTER 6, MASS.

Making Better Products to Make Other Products Better

72% INCREASE in number of slots milled to close tolerance

Redesigned Cleveland End Mill
Averages 605 Cuts per Grind

The new ***Cleveland*** End Mills have been completely redesigned to give you:

More Cuts Per Grind
Consistent, Dependable Accuracy
Faster Production and Greater Economy

Results speak for themselves: A prominent plant ran a test on the job shown above, cutting ½-inch slots in X-1335 steel. The end mills formerly used averaged 350 slots per grind. ***Cleveland*** End Mills averaged 605 slots per grind—*an increase of 72%.* One of our Service Representatives will be glad to show how you too can get lower costs, more production and greater accuracy with the new ***Cleveland*** End Mills. Contact our nearest Stockroom, or . . .

Telephone your Industrial Supply Distributor

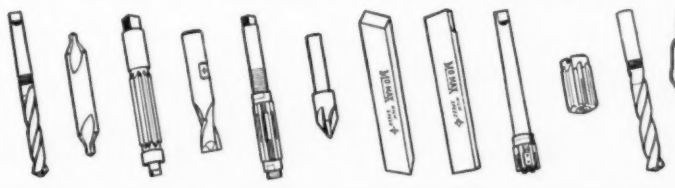
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 11

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER ***Cleveland*** TOOLS



The right aluminum alloys for automatic screw machine work

You'll increase the natural advantages of Alcoa Screw Machine Stock by selecting the right alloy for each job. Alloys are widely different . . . each with varying properties of machinability, workability and strength. To help you know aluminum and its machining better, Alcoa offers you a free copy of "Alcoa Aluminum in Automatic Screw Machines". Write Aluminum Company of America, 1709M Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA 11S-T3 . . . the best general-purpose aluminum alloy for automatic screw machines.

ALCOA 17S-T4 . . . is stronger than 11S-T3, is best for deep hole drilling.

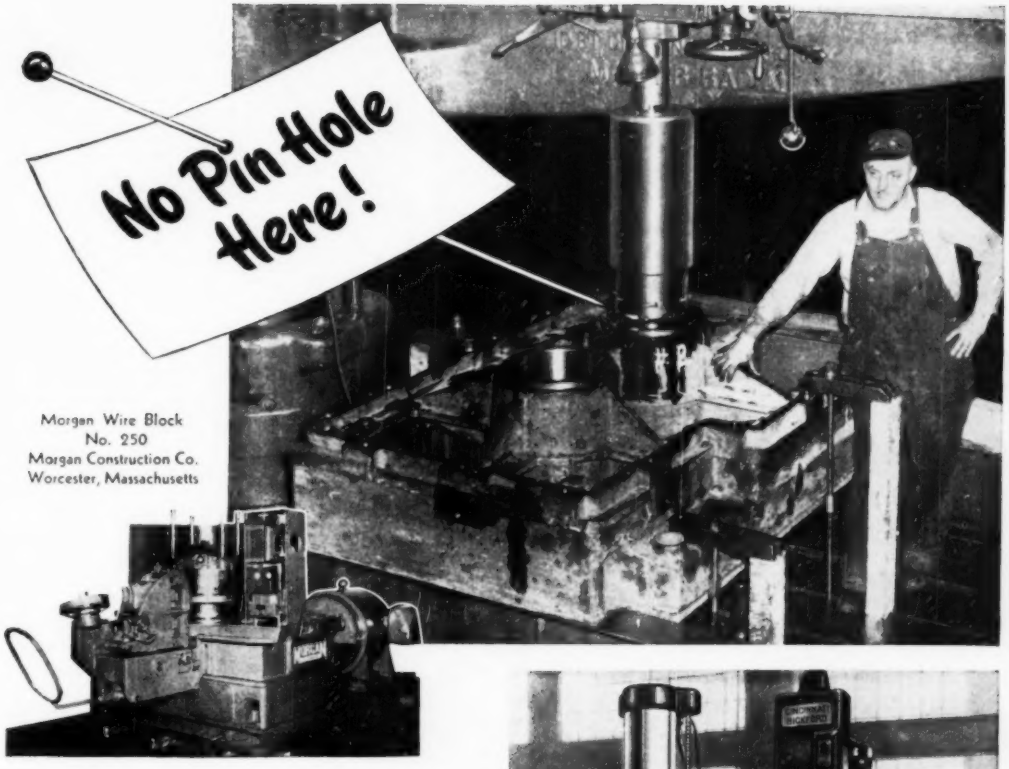
ALCOA 24S-T4 . . . is even stronger than 17S-T4 and is used for aircraft and other high-strength applications.

ALCOA 61S-T6 . . . has high corrosion resistance and is particularly adaptable to the patented Alumilite finish.

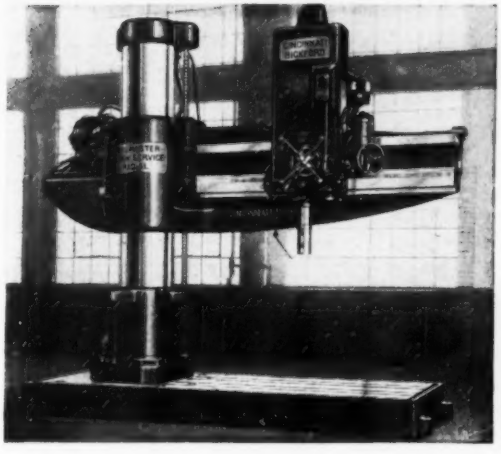
GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN **ALUMINUM**

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS



Morgan Wire Block
No. 250
Morgan Construction Co.
Worcester, Massachusetts



If your work is big, the Cincinnati Bickford Master Super Service Radial offers the power and rigidity that are definitely required. It is easily operated, and the centralized controls answer to a touch.

Highly accurate, with capacities far in excess of what today's cutting tools will stand, it handles unusually large castings economically and efficiently.

The 26" column, 12' arm, with forty horsepower, constant speed motor, is one of the largest Radial Drills built.

If your work is big—write for Bulletin R-22.

Our 75TH Year
CINCINNATI BICKFORD
1874-1949
METAL DRILLING MACHINERY
SUPER SERVICE

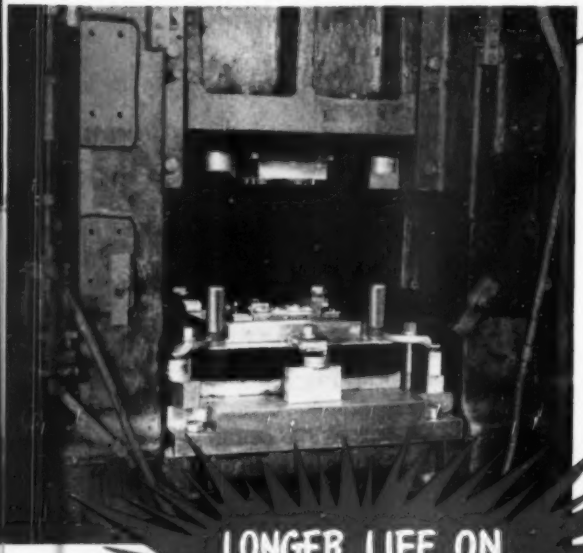
Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

DANLY DIE SETS

LESS TIME IN THE DIE SHOP

Die assembly work is easier and more accurate when it's based on reliable Danly precision.



LONGER LIFE ON THE PRODUCTION LINE

Rockwell, ground and lapped leader pins and precise bushing fits assure accurate die relationship and more parts per grind.

Danly Die Sets will assure the performance of your dies... and they mean greater convenience too! Large or small, standard or special, there's a Danly Die Set quickly available to meet your specific tooling requirements.

All standard Danly Die Sets are "on hand" in a nationwide system of assembly branches for prompt delivery from stock!

Which DANLY branch is closest to you?

- *Chicago 50, 2100 South 52nd Avenue
- *Cleveland 14, 1550 East 33rd Street
- *Dayton 2, 990 East Monument Avenue
- *Detroit 16, 1549 Temple Avenue
- *Grand Rapids, 113 Michigan Street, N.W.
- *Long Island City 1, 47-28 37th Street
- *Los Angeles 54, Ducommun Metals & Supply Co., 4890 South Alameda
- Milwaukee 2, 111 East Wisconsin Avenue
- Philadelphia 44, 18 West Chelten Avenue
- *Rochester 4, 16 Commercial Street

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. . . and see how Danly's special die set machining service will mean important savings in your tool shop.

DANLY

DANLY MACHINE SPECIALTIES, Inc. 2100 South 52nd Avenue, Chicago 50, Illinois

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

SPOT NEWS OF METALWORKING

French plant probably will be started by a U. S. machine tool builder. Management thinks that as soon as ECA funds are stopped, its European business will be reduced to a trickle unless it can produce and sell on same basis as its foreign competitors. Its American-manufactured machine is priced in France at 5 million francs, whereas prewar it was 800,000 francs. Pound devaluation is partly responsible for current dilemma.

A new type of automatic pilot utilizing the precessing principle of high-speed gyros has been built for use on military and commercial aircraft. Device measures only 12x12x8 in., weighs less than 20 lb. It is extremely sensitive, working on the change in acceleration principle to level out the flight characteristics of the plane. Adoption for high-speed military aircraft will make more flyable some supersonic aircraft previously considered impractical for combat service.

Experiments with an ac-dc locomotive indicate considerable promise. Rectifiers convert high-voltage ac from overhead lines into dc for the drive motors. In this way, most efficient power transmission and most-favorable operation are combined.

The new Studebaker automatic transmission will, like Packard's, lock out the torque converter when in high—so there is no slip. In addition, it has some other new features: A "hill holder" and an "anti-creep" mechanism, engine braking on hills and low-speed "push" starting if battery is dead. The torque converter is air-cooled for first time. It is made entirely from steel stampings mechanically joined. Result is lowest production costs.

Industry will get several million dollars in tank orders from the military as result of arms-aid program for Europe. Tanks for shipment abroad will come from U.S. stockpiles. To replace them, Army will order a new 25-ton light tank and a new heavy design. Industry will do the replacement job because Ordnance arsenals aren't equipped for mass production of heavy vehicles. Guess is that $500 million might be spent on procurement of both light and heavy tanks.

Willys Overland is in advanced development on a new high-compression engine pointed toward spring introduction. It will be in both 4- and 6-cyl. sizes. Expectations are that final compression ratio will range around 7.5:1, although experimental work as high as 8:1 has been undertaken.

Anti-corrosion liquid may be pumped moisture-free into aircraft engines being prepared for storage, through use of a method invented by an Air Force sergeant in Japan. Reported to save 1000 manhours a week, it consists of a compressor which draws air through a dehydrator, then pumps it into an oxygen tank which has been filled with the anti-corrosion liquid. An engine may be filled by removing a spark plug and inserting a hose with a triggered nozzle, releasing the liquid under pressure.

Cadillac has increased production equipment and facilities to enable production of 25% more cars in 1950. Lowest-priced Cadillac sells for less than 17 other competing models.

Establishment in Munich of a German Federal Patent Office now makes it possible for foreign firms and individuals to get squared away with Germany on the status of patents, trademarks and copyrights interrupted or impaired by the war. Business is brisk, with average of 300 patent applications coming in daily.

Gaging Metalworking

Metalworking operations are not snapping back to the prestrike level as fast as production in other lines. Lack of steel is the answer.

The fact is that many steel users were able to run almost through the strike period without interruption. But they had about exhausted their inventories by the strike's end. Then they were compelled to shut down or drastically curtail output until new steel tonnage arrived. This was the situation in which the automobile industry found itself, for instance. Even by early December one prominent car maker was not sure that it could begin to make new models for a press preview on December 15. Reason: it was uncertain about its supply of steel.

Business Transferred to 1950

No long-term damage is being done by the delay in getting enough steel into consumers' hands. It merely means a transfer of business from late 1949 to early 1950. Refrigerator manufacturers, to be specific, will bring out new models a month or two later than they had planned. Fractional horsepower motor companies will run overtime farther into the winter to catch up. There is some reason for believing that Detroit may privately have welcomed the respite from its furious production pace. January and February will be aided at the expense of December.

► January promises to be a big month for numerous metalworking lines, including home appliances. Industrial machinery is not doing as well as some consumer products. It is down in sales considerably from a year ago; but it may do very well in the coming months in such industries as construction, which will enjoy a lively business during 1950.

Machinery Exports to be Good

Exports appear likely to be a good outlet for industrial machinery sales the coming year. Europe still is under-equipped and will be procuring much new machinery from U.S. sources.

► Some observers feel that machinery demand abroad will rise as much as 20% above this year's level. This will be contrary to the trend of exports in general, the overall volume of which will be off. Roughly, the dollar volume of exports is expected to be down about $2-million from this year. But 1950 still will be a whale of a year by prewar standards; and much of the drop will be purely a price decline.

Devaluation will not seriously hurt U.S. exports as a whole. Even before devaluation, most foreign countries limited dollar purchases to essentials. And in many cases there is no substitute for American goods.

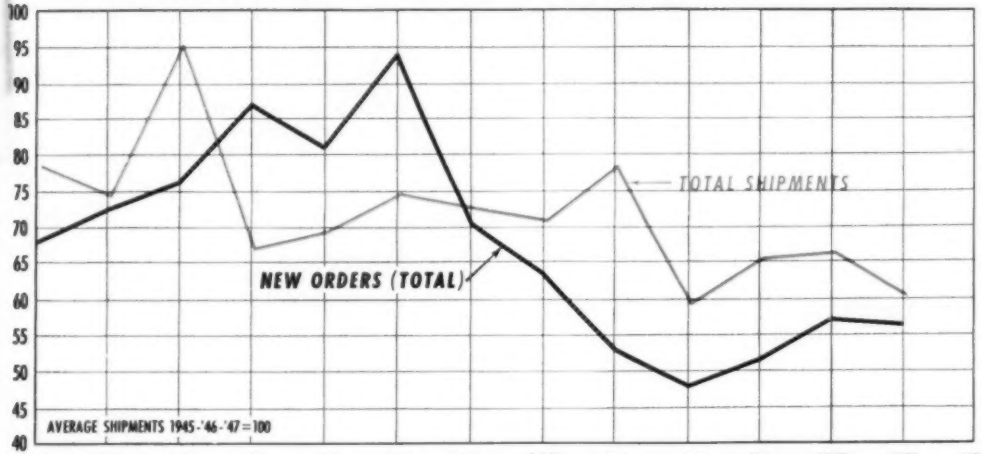
Imports are not expected to flood the American market next year. That is as true of capital metalworking goods as of other products.

Export Controls to Continue

Metalworking companies counting on trading with Europe should bear in mind that controls will continue for several years.

A quick look at the major countries shows that: (1) Germany, now far behind other countries, should make fast progress the next year or two; (2) France's prospects are bright; (3) Belgium, wealthiest of the Marshall Plan nations, will get a further lift as Germany recovers; (4) Holland's economy will improve,

SLIGHT DECLINE SHOWN IN NEW TOOL ORDERS FOR OCTOBER

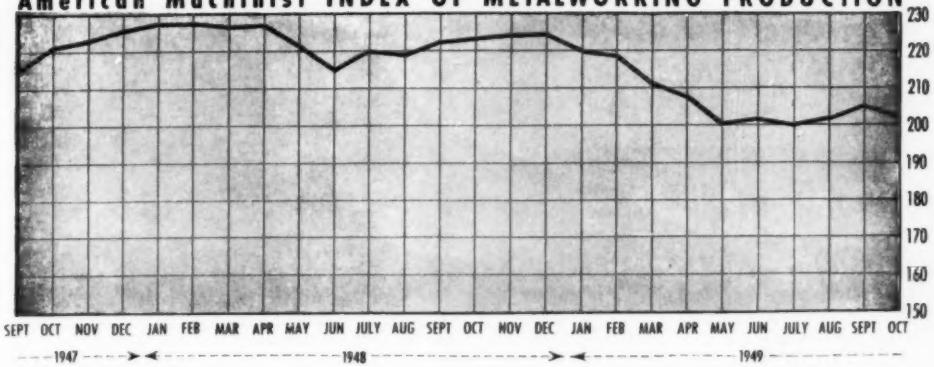


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
New Orders (Total)				87.0	80.9	93.5	70.1	63.7	53.6	48.0	51.5	57.7	p56.8	
Foreign Orders (Incl. in Total)				21.9	26.5	22.3	23.1	15.9	15.7	14.0	18.8	13.7	p13.8	
Shipments (Total)				68.8	70.3	75.8	74.9	72.8	79.0	60.7	67.3	67.6	p62.3	

Data: NMTBA

p—preliminary figures

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Oct. 1949 (preliminary)	202	194	194	240	288	135
Sept. 1949	205	194	196	247	291	136
Oct. 1948	223	250	235	223	311	155

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

but her national income will be low compared with prewar; (5) Italy's recovery has been rapid, but she will continue to have much poverty and unemployment; the United Kingdom will register gains, but is faced with years of austerity.

Machine Tool Sales Up

Machine tools are not getting the lift from capital spending that other machinery is. Many tooling replacement programs are given the green light by production executives, but are halted by top financial officers and boards of directors.

► November is estimated to have been a better month than October in machine tool sales. It will not be surprising, however, if December drops off a bit. New machine tool orders for the year 1949 are likely to be around $205 million. Shipments will total about $250 million, compared with $285 million during 1948.

The extent of export demand still is the big question mark in machine tools. During the current ECA fiscal year (July 1, 1949, to June 30, 1950) the European participating nations will buy approximately 18% of all their new machine tools from U.S. builders as against 8% prewar. But as ECA assistance dwindles, the ratio is expected to decline perhaps to 10%.

Detroit continues to provide more new domestic machine tool business than any other source, though aircraft engine and electrical manufacturing also are active spots.

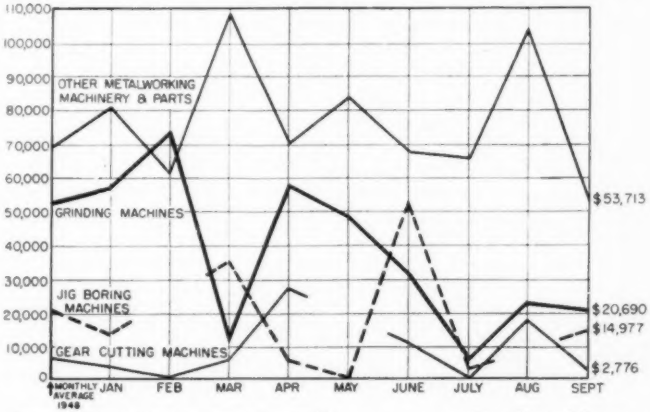
Metal Prices Level Off

Prices of metals and metal products, which have been tending steadily downward in the last year, may be leveling off. Since October, 1948, the Bureau of Labor Statistics' wholesale price index on metals and metal products has dropped from 172.4, its high point, to about 167. Biggest part of the drop has been accounted for by a 15% drop in nonferrous metals prices.

But no immediate stop to the decline is seen for tin. Stocks here have grown to the point where the government has dropped all but a hint of controls. The good supply situation here, plus the fact that the British Board of Trade has been dumping excess stocks of the metal on the world market, has caused a heavy price drop.

Futures quotations for early 1950 have been running near the 77 cent level, and some quotations have gone as low as 70 cents. Government experts confidentially expect the price to level off at about 70 to 75 cents a pound in the near future.

IMPORTS OF MACHINE TOOLS DROP SHARPLY



(Interrupted lines indicate no imports for month)

Data: Dept. of Commerce

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REGAL OILS (R&O) KEEP HYDRAULIC SYSTEMS

– RUST-FREE

– SLUDGE-FREE

– FOAM-FREE

You get much longer pump life . . . much greater efficiency and freedom from costly stoppages . . . when you charge hydraulic systems with *Texaco Regal Oils (R & O)*. First of all, they're rust-inhibited. Moisture can't get at the metal. Valves, gears and other parts all last longer because of this protection.

In addition, the special oxidation inhibitor in *Texaco Regal Oils (R & O)* fights sludge formation even under severe conditions. This assures free action of pumps and valves . . . keeps small orifices from clogging. And *Texaco Regal Oils (R & O)* are specially processed to prevent the foaming that causes erratic operation.

You can get *Texaco Regal Oils (R & O)* in the right viscosities—without "cutting back"—for every type and size of hydraulic mechanism. *Texaco Regal Oils (R & O)* are recommended by leading builders of hydraulic equipment, many of whom ship their units already charged with these fine, turbine-grade oils.

The success of *Texaco Regal Oils (R & O)* in improving hydraulic performance and reducing costs has been proved in plants everywhere. Let a Texaco Lubrication Engineer help you get these same benefits. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

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TEXACO Regal Oils (R&O)
FOR ALL HYDRAULIC UNITS

TEXACO STAR THEATRE presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

A Word To Mr. Reuther

High labor costs appear to be here to stay. They promise to go even higher if Mr. Truman gets all or part of his Welfare State.

Wage rates are up in the sky now. There is no reason to believe that they will drop.

Pensions are a hot issue. And the granting of pensions is equivalent to a pay raise, as far as management's costs are concerned.

Other benefits, too, are being granted. Surveys have shown that the so-called "fringe benefits" (other than hourly rates) average as much as twenty to thirty cents an hour per employee.

Just what chance is there, then, for management to cut costs? The answer is in getting more production from each worker with no increase in physical effort on his part.

That means installation of new machines which run faster and turn out more than the old machines that most plants possess.

"Fine for labor," you say. "The workman gets more and more over a period of years, and actually has to do less manual work than he used to.

"He has more money to spend for the things his family needs and wants. That makes possible a higher standard of living for his family."

But when management steps out to buy new machines and employs its earnings for that worthy purpose, union leaders object. No less a national labor figure than Walter Reuther has publicly protested in no uncertain language.

One would think, after reading Mr. Reuther, that in expending some of its earnings to replace old machines with new, industry was committing a reprehensible act. It was trying to slip over something.

Mr. Reuther thinks that management should go out and get "venture capital" to finance such purchases. In other words, it should resort to borrowing.

The position taken by Mr. Reuther and other labor leaders who subscribe to the same doctrine would be comical were it not bordering on the tragic.

In the first place, union officials are doing their best to bring into being a Welfare State which by its nature frightens away venture capital.

Apart from that fact, however, we wish to point out to Mr. Reuther that he is helping to defeat his own purpose. He wants the members of his union to get higher and higher wages. He wants them to have bigger and bigger pensions, and more social insurance of all kinds.

He should recognize that management can't pick new grants to employees off trees. If it pays out more to its employees, it has to make up the difference in improved efficiency. It cannot raise prices without the entire economy suffering. The real key to continuation of good times is to reduce prices and make it possible for people to buy more goods.

New production equipment which reduces costs is the answer, as we said before. If Mr. Reuther is as smart as we think he is, he will encourage management to provide his union members with the best possible working tools. And he will encourage the use of a reasonable amount of earnings for that purpose.

He then will be taking out the best kind of insurance in behalf of his own organization as well as of our national economy.

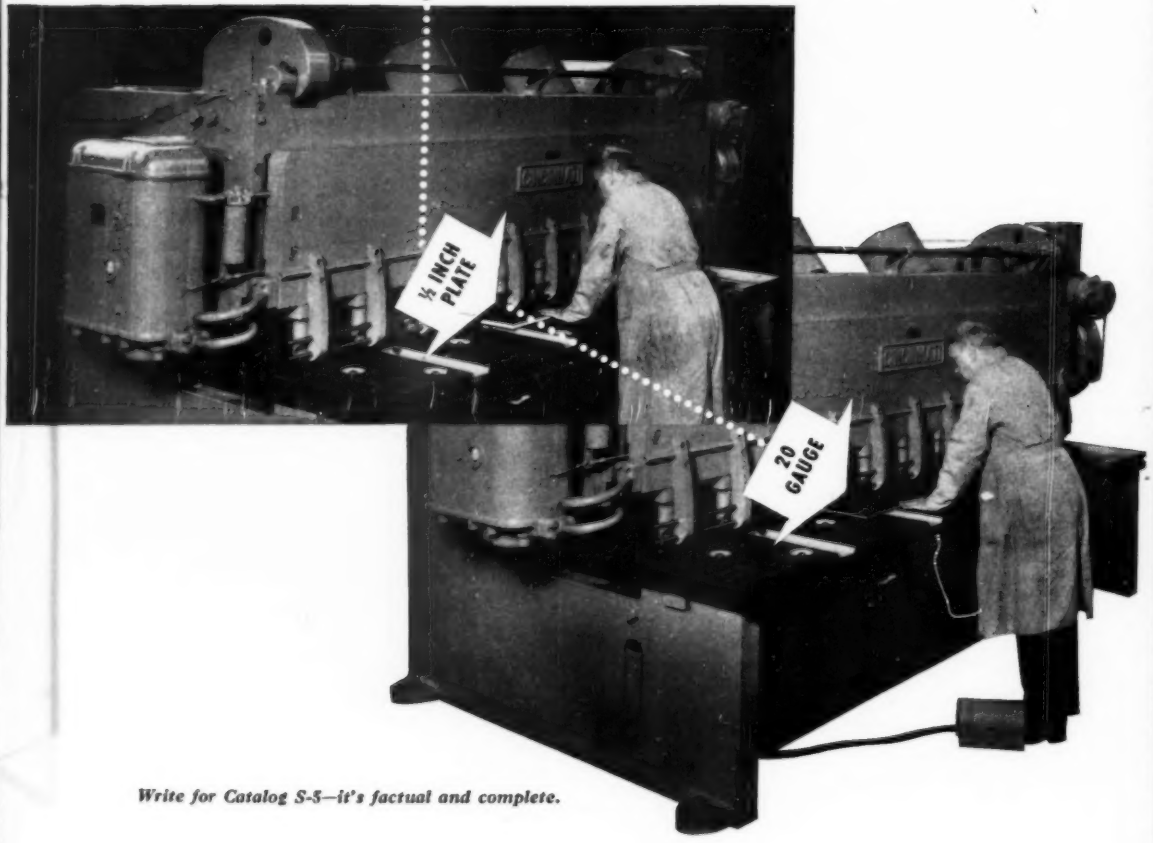
Burnham Finney

EDITOR

SHEAR ½" PLATE OR 20 GAUGE SHEETS

without changing knife clearance

ON A CINCINNATI . . .



Write for Catalog S-5—it's factual and complete.

. . . You do not change knife clearance for successful shearing of different thicknesses on a Cincinnati. Just set the clearance for the thinnest material and shear all thicknesses up to capacity. Thousands of Cincinnati Shears are used continuously in this manner. This practical method prevents accidental damage—saves time. Remember, changing knife clearance interrupts production. Investigate the Cincinnati All-Steel Shear and its accurate, time-saving features.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

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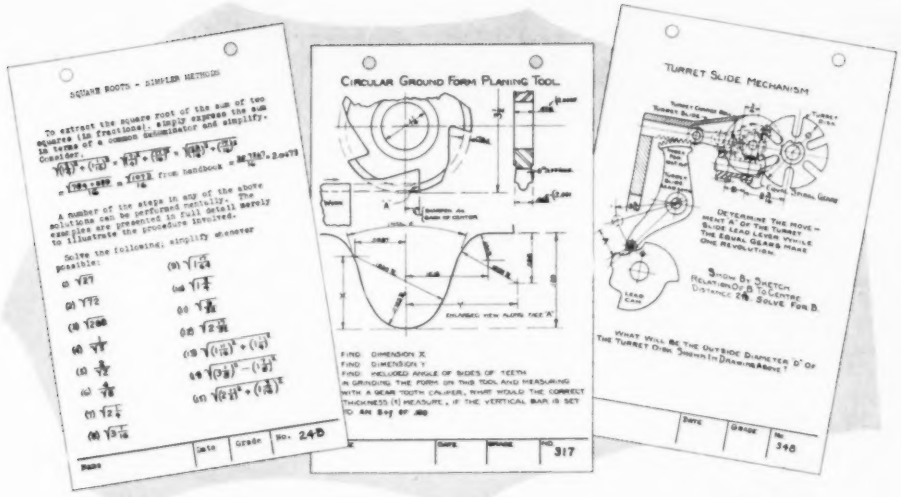


Typical school sheets prepared by Brown & Sharpe for use in the apprentice program

A CENTURY OF APPRENTICE TRAINING

In 1848, Jos. R. Brown took on Lucian Sharpe as an apprentice. The success of that experience may be the reason that apprenticeship has always played so large a part in Brown & Sharpe's operations

BY ANDERSON ASHBURN, Associate Editor

Now starting into its second century, the apprenticeship program at Brown & Sharpe Manufacturing Co., Providence, R. I., is perhaps the oldest continuous program in the metalworking industry. Certainly it is the best known.

From the early days of its operation, the graduate apprentice from Brown & Sharpe has been sought after by employers and respected by his fellow workmen. Today there are 1073 known living graduates of the program.

A study of such a well-developed program with so long a record of graduates is rewarding in many ways. It shows how the apprentice program has benefitted the company and the apprentices, and how the program is operated, after so many years of experience.

Of all the living graduates, 55% are today employed in some supervisory position, 26% are still employed as skilled craftsmen, and another 6% are retired. Less than 1% are employed at levels of skill less than that for which they were trained. About a third of the total have been graduated within the past 11 years, and it is likely that many of these, now employed as craftsmen, will advance to supervisory work.

Of all graduates since 1884, 30% are still with the company. Of men graduating within the past few years, a higher percentage is still with the company, but some of these can normally be expected to leave the company eventually for positions elsewhere.

The apprentice program is at present under the direction of J. H. B. Machon, supervisor of apprentices, who is responsible directly to the Industrial Activities Administrator. He is normally aided by three full-time and one part-time job instructors, and two full-time and three part-time classroom instructors. Mr. Machon graduated from the machinist course in 1922. All of those associated with the program are also graduate apprentices and are skilled workers or executives employed at the plant.

Of the 150 apprentices normally employed, 55% are in the machinist course, 17% are draftsmen, 10% are moulders, 8% wood and metal patternmakers, and the remainder are distributed among the special training courses, such as coremaking and screw-machine operation.

Because of the reputation of the program, se-

curing apprentices has not been a problem for as long as anyone at the company can remember. There is a long waiting list and the local schools add to it by encouraging promising boys to apply. The present enrollment comes from eight states, but at times it has been more widespread than this. About two-thirds of the apprentices, however, come from the local area—Rhode Island and Massachusetts.

Age requirements vary somewhat for the different courses. The 16-19 year age range for candidates for the machinist course and the 17-20 year range for molder applicants are typical.

Aptitude the Key Factor

Applicants must meet the physical requirements and must pass intelligence, aptitude, and mathematics tests. However, the selection of applicants is determined as much by their interests and aptitudes (applicants are interviewed personally) as by their records.

A homely illustration of this approach appears in the catalog sent to those who inquire about the apprentice program: "Some time ago, a father and son came to our apprentice office . . . the father told us of his son's trustworthiness, honesty, and other general qualifications, all of which were beyond question. Then the son was asked whether or not he was really anxious to come to us as an apprentice. He frankly answered that he did not want to become an apprentice because he had set his mind on being a church organist."

After further explanation of the boy's background, which included training in piano and organ, and the father's desire that the boy learn the art of machinery manufacture, the catalog concludes dryly, "If that young man had started with us, he probably would never have made a success."

The apprentice office at Brown & Sharpe interviews hundreds of applicants every year, not all of whom are as positive in their ambitions as this one was. Their experience in analyzing the inclinations and fitness of the applicants is probably more responsible for the success of their graduates than any other single factor.

One result of this is that, although apprenticeship agreements can be terminated at any time, this rarely happens. When it does it is usually because of failure to keep up-to-date on classwork assignments.

Perhaps the present generation is more stable or the selection more careful, but there are now no problems like that reported in the log for 1900, which said of one apprentice: "Inclined to be sporty, and was threatened with trouble by a girl who called at the office and saw HDS. Impression prevailed that he continued chewing tobacco surreptitiously after prohibitory law went into effect."

The first 12 weeks are a probationary period, at the end of which time the indentures are signed. At this time, the apprentice pays a $50 fee and purchases the appropriate tool kit for the course he has entered. The company supplies the tools during the probationary period and furnishes books without charge throughout the course.

School sheets, prepared by the company, are used in all except the special courses. These serve as texts, assignments, and for future reference. Loose leaf in form, they are easy to modify.

In addition, there is a well-stocked library in the apprentice building. Adjacent to this building is a small shop for special phases of training. All regular shop training is given in the plant with section foremen, assistant section foremen, and set-up men as instructors.

Shop Jobs Analyzed

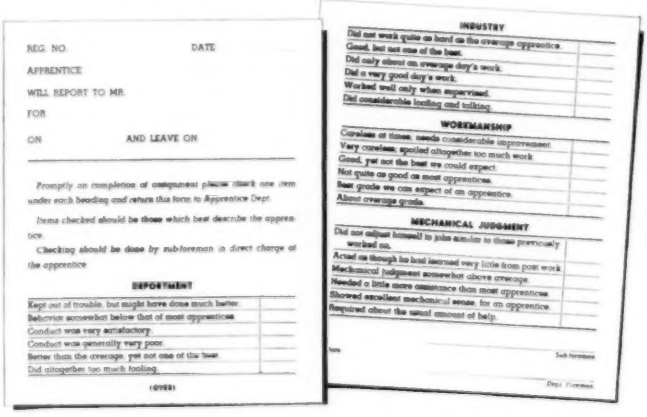
Each shop assignment of the apprentices is analyzed in outline form. The apprentice receives this analysis when he starts on the job. From it he can tell what he is expected to learn on that job. He is graded on each assignment by the sub-foreman in direct charge of the job.

The apprentice schedule includes about 4½ hours of classwork per week in addition to the shop work. Assignments require about 5 hours of homework a week. Many of the apprentices also go to night school, there being excellent facilities for this in the city.

Classes average about 12 apprentices. The regular instructors give most of the training but there are frequent lectures by men specially qualified in their subjects.

During the latter part of the training period there are special classes in foremanship, planning and estimating, electrical controls, and precision measurement. At least once each week an apprentice prepares and delivers a lecture to a group of his fellow apprentices. A wire recorder is available so they can benefit from a study of their own performance.

The wage scale for apprentices varies according to the trade con-



REG. NO. DATE

APPRENTICE

WILL REPORT TO MR.

FOR

ON AND LEAVE ON

Promptly on completion of assignment please check one item under each heading and return this form to Apprentice Dept.

Items checked should be those which best describe the apprentice.

Checking should be done by sub-foreman in direct charge of the apprentice.

DEPORTMENT

Kept out of trouble, but might have done much better.	
Behavior somewhat below that of most apprentices.	
Conduct was very satisfactory.	
Conduct was generally very poor.	
Better than the average, yet not one of the best.	
Did altogether too much fooling.	

(over)

INDUSTRY

Did not work quite as hard as the average apprentice.	
Good, but not one of the best.	
Did only about an average day's work.	
Did a very good day's work.	
Worked well only when supervised.	
Did considerable fooling and talking.	

WORKMANSHIP

Careless at times, needs considerable improvement.	
Very careless, spoiled altogether too much work.	
Good, yet not the best we could expect.	
Not quite as good as most apprentices.	
Best grade we can expect of an apprentice.	
About average grade.	

MECHANICAL JUDGMENT

Did not adjust himself to jobs similar to those previously worked on.	
Acted as though he had learned very little from past work.	
Mechanical judgment somewhat above average.	
Needed a little more assistance than most apprentices.	
Showed excellent mechanical sense, for an apprentice.	
Required about the usual amount of help.	

Sub-foreman

Dept. Foreman

Performance report on each shop assignment of an apprentice is filled out by the sub-foreman in charge of the apprentice

APPRENTICE PROGRAM FOR MACHINISTS' TRADE AT BROWN & SHARPE

SHOP PROGRAM

SUBJECT	WEEKS
Engine lathes	24
Turret lathes	7
Drills	6
Milling	24
Scraping	4
Thread milling	2
Assembling and erecting milling machines	10
Inspection	2
Grinding	12
Assembling and erecting grinding machines	10
Operating hand screw machines	4
Operating automatic screw machines	2
Assembling spindles	3
Assembling and erecting screw machines	10
Gear cutting	8
Planing	12
General machinist work	16
Repairs	18
Toolmaking	20
Miscellaneous	6
	200

SCHOOL PROGRAM

FIRST YEAR

SUBJECT	HOURS
Blueprint reading	18
Review mathematics	24
Cutting lubricants	2
Steel specifications	2
Isometrics	12
Working drawings	30
Tapers	11
Crowning and speeds of pulleys	8
Gear speeds	5
Cutting and grinding speeds and feeds	13
Planer speeds	2
Angles and triangles	5
*Problems related to trial period work: multiplication, division of fractions, square root, mensuration	12
*Geometry (outside study required)	30
*Periodic tests and examinations	12
*Problems based on geometry	14
	200

* Courses common to all apprentice programs

SECOND YEAR

SUBJECT	HOURS
Applied trigonometry	32
Logarithms	9
Threads (including thread drawing)	26
Continued fractions	2
Screw cutting	7
Thread milling	5
Spur gears and sprockets	14
Spur-gear drawing	7
Bevel gearing	14
*Periodic tests and examinations	14
*Problems on geometry	8
*Lectures on trigonometry and trig tables	3
*Derivation of screw thread formulas	2
*Trigonometry problems	40
*Basic algebraic laws (plus outside study)	4
*Simple algebraic related work problems	8
*Spur-gear formulas derived	2
*Bevel-gear formulas derived	2
	200

THIRD YEAR

SUBJECT	HOURS
Bevel-gear drawing	6
Indexing (gear-cutting machines and linear indexing on milling machines)	8
Gear center distances and oblique triangles	28
Worms and worm wheels	20
Worm and worm-wheel drawing	11
Hobs	11
Screw-machine cams	11
Circular form tools	6
Plate and quick-return cam drawing	9
Elementary mechanics	22
Length of belts	6
Milling vise problems	2
*Periodic tests and examinations	10
*Law sines and cosines—derivation and usage	4
*Oblique triangles—problems	8
*Hobs—derive formulas	2
*Algebra (quadratics)	2
*Quadratic problems from practical work	10
*Misc. trigonometry and algebra combined problems	24
	200

FOURTH YEAR

SUBJECT	HOURS
Indexing (plain and differential)	6
Gearing on spiral heads	6
Change-gear calculations by logarithms	6
Spiral milling (leads and angles)	6
Cam milling (leads and angles with vertical attachment)	6
Spiral or helical gearing	13
Applied physics	35
Mechanics of fluids	10
Heat	2
Problems in single and double angular form tools	6
Practical applications of problems to machine parts	60
*Periodic tests and examinations	10
*Friction, inclined plane, jackscrew formulas derived	4
*Problems from practical work on above	10
*Compound angle lecture	2
*Compound problems	18
	200

EXTRA CLASS WORK

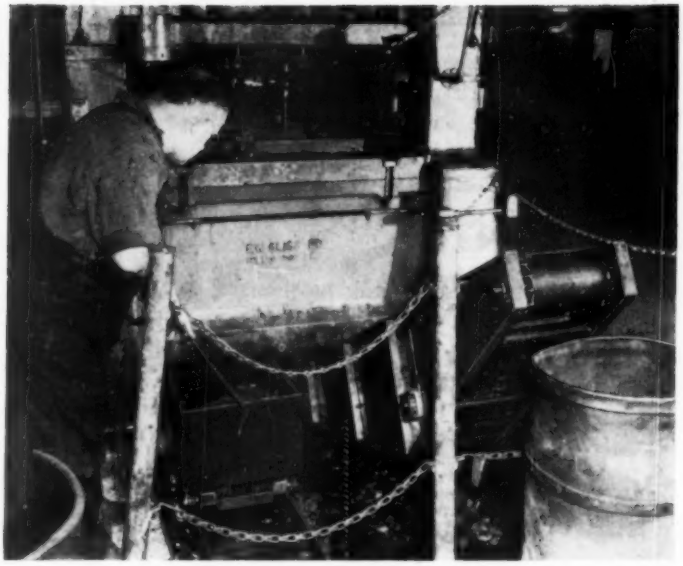
Foremanship	40
Job planning and estimating	20
Electricity	45
Precision measurements	14

cerned. Apprentices rated "excellent" are paid 2 to 5¢ an hour more than "regular" apprentices. In addition, they can earn still more by working on a wage-incentive basis. The primary purpose of this wage-incentive plan is to teach apprentices the value of the production factor in industry.

Upon completion of his apprenticeship, each apprentice is presented with a "Journeyman's Certificate" and receives a bonus of $150 for the 3-year courses and $200 for the 4-year courses.

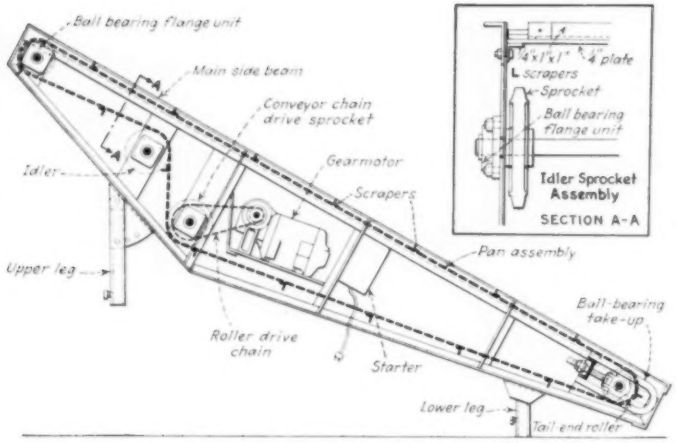
Dormitories are provided for out-of-town apprentices at $2.30 a week per room. There is less emphasis upon social activities than in many apprentice programs, but the company does provide tennis and horse-shoe courts and table-tennis rooms at the dormitories. There is an annual banquet and an outing for the apprentices, and many become junior members of the Providence Engineering Society.

Each apprentice is periodically interviewed by several of the company executives who submit written reports of their impressions. These interviews, and the reports, aid materially in placing the graduates, either in the company or elsewhere.



Scraper conveyor and scrap cart are located in pit under chain link press. Conveyor handles parts: cart accumulates slugs blanked from pin and attachment holes in chain link. Scrap cart consists of welded steel dolly on which skid box is placed by overhead hoist. Operator has hook to move unit along two inverted angle rails bolted in floor of pit on 18-in. centers. When full, skid box is hoisted from dolly for transfer to scrap bins

HANDLING DEVICES REDUCE PRESS TIE-UPS



Welded frame for conveyor consists of two 10$^{5}/_{8}$-in. side assemblies separated by steel scraper pan at top and four welded steel straps along bottom. Plate and straps are 12$^{1}/_{4}$ in. wide. Conveyor chain consists of two 13-ft long loops of No. 55 pressed steel detachable chain, 1.630-in. pitch, with No. G-27 attachments every eight lengths to support twelve steel angle scraper bars. Gearmotor drives conveyor power shaft through roller chain. Two different conveyor speeds are obtained by using 12 or 15 tooth sprockets on output shaft of gearmotor. A 15-ft extension cord connects drive motor to electric outlets located near each press

BY HOWARD BREITZMAN
Maintenance Supervisor
CHAIN BELT COMPANY

HANDLING of parts and scrap is a serious problem at punch presses set up to blank heavy chain side links from steel bar stock. Scrap accumulates in the press pits and, unless some mechanical means is provided to remove it, must be shoveled out by hand. At the Chain Division of the Chain Belt Company this problem has been solved by developing standard inclined scraper conveyors and small scrap carts which are placed in the press pits as needed.

Evolved from previously used scrap conveyors which employed leather belts and leather slats but did not prove satisfactory, the present conveyor was developed by Chain Belt design and production engineers, and units were constructed by the maintenance department of the Chain Division. Design of the welded steel frame

Two flexible units permit rapid disposal of work and scrap—an operation that is essential to full realization of the production possibilities inherent in punch-press tooling

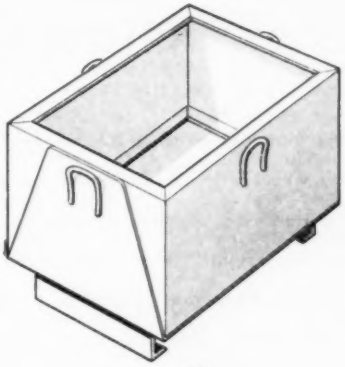
includes sturdy quadruped support braces for the upper legs, on which the conveyor frame rests, so angle of incline can be adjusted to suit the depth of the press pit in which the unit is installed. Also, leg extensions of different lengths can be inserted in the four support legs, and locked in place with setscrews, for the same purpose.

Main side beams of the frame assembly are $\frac{1}{4}$x2x2$\frac{1}{2}$-in. steel angles with the 2-in. leg sheared to 1$\frac{1}{4}$-in. width. Other members of the side frame assemblies are $\frac{1}{4}$x$\frac{1}{4}$x1$\frac{1}{4}$-in. steel angles. Bolted to the side frames with angles is the scraper pan plate. The plate is beveled on the underside at the head end for close positioning against the head-end roller, and on the upper side at the tail end so the conveyor chains and scraper bars will not catch as they move from the tail-end rollers onto the plate. Inside surface of each frame is covered with 14-gage steel sheet to protect the conveyor chain and its drive from dust and falling articles.

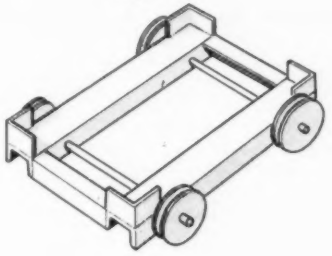
The scraper-and-chain assembly rides over the top surface of the pan, over the head-end roller, returns through the inside of the frame over two 10-tooth idler sprockets, under two 12-tooth drive sprockets, and then over the tail-end rollers.

The power shaft for the conveyor chains is driven by a 1/3-hp Master gearmotor whose output shaft rotates at 36 rpm. The drive is through a No. 40 roller chain. In all cases, the driven shaft has a 30-tooth No. 40 sprocket. For slow-speed presses, a 12-tooth No. 40 sprocket on the motor shaft gives a conveyor speed of 23.5 fpm. When the conveyor operates with higher-speed presses, a 15-tooth sprocket is placed on the motor shaft to give a conveyor speed of 35 fpm.

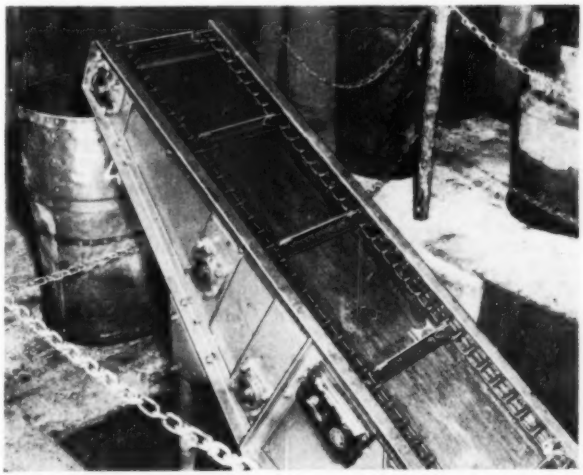
For scrap removal, the skid box is lifted from the dolly by a hoist attached to the loops on the right-angle ends of the bottom section; this holds the bottom shut. Cranes or lift trucks then transport the box to the scrap area, where hoists are hooked to the loops on the sides of the box. As the box is raised, the bottom opens and scrap falls into the storage bin.



Skid box is of steel sheet welded together to form a four-sided, open-bottom box and reinforced with steel angles welded inside. Bottom section is hinged to side of box and has two right-angle sections, one on each end, which fit outside end walls of box. When hoist lifts assembly by loops attached to these sections, bottom is held closed. But when hoist hooks are transferred to loops at sides of box, hinged bottom falls open, dumping scrap



Welded steel dolly for scrap cart is supported on 4-in. dia, grooved caster wheels, and has vertical angles welded at each corner to center skid box in position



Parts conveyor can be transferred readily from one press pit to another. Conveyor supports are adjustable so angle of incline can be varied to suit pits of different depths. Chain speed also can be adjusted for fast or slow presses. Pushbutton starter for motor is mounted on plate inside frame so face of cover is flush with outside panel. This eliminates danger of damaging starter when conveyor is lifted from pit with crane and is transferred to another press

Personnel Records

Anticipate Mental Outbursts

Psychiatric emergencies occur every day in shops and factories the world over. At least one bystander is usually heard to say, "Without the slightest warning he started screaming and smashing equipment!" Was there really no warning—or were early symptoms ignored? Accurate personnel health records that include mental attitudes, plus a knowledge of the symptoms, will minimize the danger of a mental explosion in your plant

WLADIMIR G. ELIASBERG, M.D., Ph.D., F.A.P.A.
Consultant, INDUSTRIAL PSYCHIATRY

FIFTY PERCENT of the emergencies which regularly harass industry can be prevented by maintaining an employee roster of physical and mental health. Although this record must be kept confidential—to protect the individual, its use should not be restricted to top management only. Foremen who are aware of the health risks of those people whom they supervise are in an excellent position to prevent emergencies at their source. Of course, these foremen should be trained to recognize symptoms or warnings in the early stages.

Sudden events that may result in an emergency are very often predictable. Psychiatric emergencies are more readily predictable than all others. A psychiatrist, given the opportunity to watch people at work, may be able to predict approaching trouble, and thus provide timely warning. Signs of imminent outburst are not, however, limited to the professional eye. Laymen, such as foremen or plant nurses with no special psychiatric training, having observed previous spells, may quickly sense trouble. Lack of previous experience with plant presonnel may obscure potential danger from the trained physician.

Most plant nurses do maintain a record of employees' physical ills; mental or nervous conditions should be included in this history. By regularly reviewing these reports with the nurse, foremen place themselves in a better position to predict certain types of outbursts. A system for properly maintaining notes, and a health history of each employee will, of itself, avoid about 50% of the usual plant emergencies by forewarning the supervision concerned. This information should be available to plant doctors, nurses, and those foremen having responsibility for the employee concerned.

What are these potential dangers? The first, and most destructive to the victim and the organization, is suicide. Other mental ills caused by diseases such as a post-syphilitic progressive paralysis, diabetes, or epilepsy are slightly less shocking but no less important. These, together with the mental attitude resulting from misuse of drugs and alcohol, constant headache, hysteria, or neurosis, plus the true manic-depressive psychotic, constitute a far greater danger to other shop personnel than a suicide. There are very few organizations which do not at some time have among their personnel a mentally ill employee. Not always dangerous—some will for years act morose or "strange" and never go berserk. But the hazard is always present. Steps should be taken to record the signs of these conditions and then to avoid irritating them or exposing others to possible danger.

Suicide

Few suicides are planned; more are sudden decisions forced by overpowering anxiety. If a suicide occurs in your plant it will be costly in manhours, manpower, and trouble for days, even weeks, following. Accident-proneness will increase for every employee in the area. People known to be perfectly normal will seldom experience such overpowering pathological anxiety states. On the other hand, this condition is frequent with the manic-depressive psychosis—particularly in the depressive stage. It is rare that suicide is attempted with the first spell, and a previous record or knowledge of the condition plus immediate action is the best prevention against it.

A man known to have had depressive or manic spells gets very restless and shows signs of anxiety. Place him where he can reach nothing harmful and watch him carefully—but let him get "it" out of his system. His teammates should not be aware of any sighing, panting, clamoring, or crying that occurs. He literally should not be seen or heard from until fully recovered and composed.

Chronic Disease

Typical of possible outbursts is progressive paralysis, a post-syphilitic disease. The patient, whose efficiency has gradually decreased, sudddenly becomes confused, excited, talks nonsense, "stares" at

others. (Although laymen call it "stare," in reality it is the effect of very large pupils which no longer respond to light.)

A strongly positive Wasserman test in an employee beyond his fortieth year, is a danger sign. This person has active syphilis; may also fall prey to the so-called after-syphilitic diseases. If possible the Wasserman reaction should be noted in the employee's medical record.

Diabetes

Hyperinsulinism, a condition which results from the patient overdosing himself with insulin, causes confusion and disorientation. The patient's respiration is labored, his pupils dilated as with the syphilitic paralysis, pulse rapid, and blood pressure elevated. There is a tendency for such patients to commit crimes.

If the person can take fluid, he should be given a glass of strongly sweetened orange juice, whereupon he will miraculously revert to normality. Should the person refuse the juice, he must be overpowered and force-fed with a nosetube. Knowledge that the person is a diabetic who chronically takes insulin is, of itself, the diagnosis of the acute state of confusion and excitement.

Drugs and Alcohol

Many drugs may cause conditions of confusion and motor-excitability. Alcohol is one of the best-known examples. One acute alcoholic overdose (hangover) will cause little trouble in the plant. Alcohol-disease is a chronic illness with acute outburst such as delirium tremens which, however, will usually prevent the man from coming into the plant; a different story entirely. When it appears it is not with the massive, barnstorming motility of the hyperinsulin patient, but rather entirely different, small movements indicating restlessness. Alcohol odor is not always present in such cases.

Cocaine and marihuana ("reefers") addiction is rare among shop employees. Morphine addiction will, however, occur occasionally afer an operation or a prolonged period of severe pain. Again, such conditions should be noted in the record. If the efficiency of the employee repeatedly drops acutely and, after a short absence to the washroom, suddenly returns, you may suspect drugs—also if there are numerous skin eruptions or direct marks of needle jabs. Not only the efficiency, but mood and temper, too, show sharp ups and downs. Morphine patients lack reliability insofar as anything connected with their addiction is concerned. They may lead a double existence, steal to pay for illegal drugs; thus many inexplicable thefts are committed by drug-addicted employees.

Six girls refused to take a certain position that had been troublesome before. Five of the group had hysterics repeatedly and complained about their rate although they were all getting a good bonus. Then it was discovered that one of the six had been stealing. When she was apprehended, examination showed her to be a morphine addict. The other girls did not know or at least would not tell what caused their unrest, but a morphine addict upset the entire group and caused considerable production loss.

Hysteria

Hysteria has its fads and fashions of expression. An attack consists of outbursts such as crying, sobbing, and wild gesticulation. Important events in this connection are not of expressive or motoric-expressive order; instead the foreground holds such social disruptions as swindling, lying, and stealing. Hysterical psychopathy is sometimes doubled with addiction.

In industry the hysterical psychopaths and progressive paralytics considerably outnumber hyperinsulinic diabetics and delirium tremens.

Manic-Depressive

If a person who has had one or several spells gets rather talkative, very jolly, tells many jokes, is unresponsive to admonitions or laughs them off, look out for trouble. These patients are seldom gentle, particularly as they become angry or excitable. Know your man, record your knowledge, and you have the diagnosis. Follow through by immediate removal from the plant.

Headache

Acute "unbearable" headache, other than migrainous, often is of psychogenic order that can be connected with hysteria. The symptom headache must of course be diagnosed by a doctor. If it is psychogenic, the personnel department must follow the case as trouble probably will occur, as with other psychogenic disorders.

Epileptics

The effect of an epileptic spell upon the bystanders who view it is so startling, so shaking, that production is impeded for a considerable time afterward. For this reason, hiring of epileptics with more than one spell a year should be avoided. If the first spell occurs on the job, further employment must be such that spells will not disrupt working groups. Records may establish a rough pattern for these spells and thus forewarn management.

Accidents and Neurosis

The direct hit effect of an accident is often less costly than the disruption of morale among the onlookers. Such events also provide a measure for group morale. The higher this morale, the fewer bystanders that will become hysterical. If reaction is severe the morale may have been on the breaking point for some totally unsuspected reason, which must be found out. Generally speaking, the younger age brackets are more amenable to such effects.

Two out of thirty women fainted and five others stayed home for three days following an accident in which a man fell through an unsupported part of the ceiling and crashed against the table where they worked. This general hysteria was followed by a lengthy period during which any loud noise caused them to stop working and look around.

Every note that is written, every action taken to improve morale or avoid any outburst, will save you money and trouble. What are you doing about it now?

Basic Rules Govern Welding Fixture Design

Properly designed fixtures

can effect substantial economies in resistance welding.

Here are 13 rules to observe in designing them

NECESSITY for accommodating manufacturing costs to the present buyer's market has focused attention on the importance of employing properly designed jigs and fixtures for the most efficient application of resistance welding in the manufacture of consumer goods.

Presented here are thirteen basic rules governing the design of such fixtures. They are the end-product of countless trial-and-error tests in hundreds of welding shops, and combine not only the best thought of welding theorists, but the know-how of practical men who have had to deal with each problem as it arose. They are compiled from practice and the revised regulations included in the Resistance Welding Manual and are given as a guide to the welding technician and shop manager.

RULE 1.. *Keep all magnetic materials (iron and steel) out of the "loop."*

By loop is meant, in a spotwelder, the gap surrounded by the upper and lower arm, the electrodes and the base of the machine housing the transformer. This gap is an intense magnetic field and any iron or steel placed therein will become hot, and in some cases actually melt. Also the presence of these materials in the loop chokes the available welding current and makes for poor efficiency of the welder.

RULE 2.. *Keep the loop as small as possible.*

This space, sometimes called the throat gap, is the cause of many disappointing results in setting up and installing fixtures. Many times a 24-in. or longer throat machine is used where a 12-in. or even smaller throat machine could be used to better advantage. Also, over-all height of welding fixtures should be reduced to a minimum. This makes for greater welder efficiency and makes possible the doing of jobs that may seem too heavy for the machine, eliminating excessive losses due to increased reactance and lowered power factor of the machine.

RULE 3.. *Make all welding electrodes easily and quickly replaceable, and water cool them as close to the tip as possible.*

In almost every type of spotwelding fixture, standard electrode tips can be used. These are readily obtained and inexpensive to replace. The inlet water tube should be not less than 3/16- to $\frac{3}{8}$-in. ID.

RULE 4.. *Insulate all gage pins, clamps, locators and index pins.*

In all fixtures where locating pins touch the work they must be insulated from the current-carrying plate or fixture base by being pressed into a fiber, bakelite or other insulating sleeve having projecting shoulders which are pressed into the fixture base. When a gage pin or stop touches both pieces of work being welded it should be easily replaceable, because electric current shunting across the pin will pit and burn it. Some fair results have been obtained by chrome plating such pins to prolong their service life.

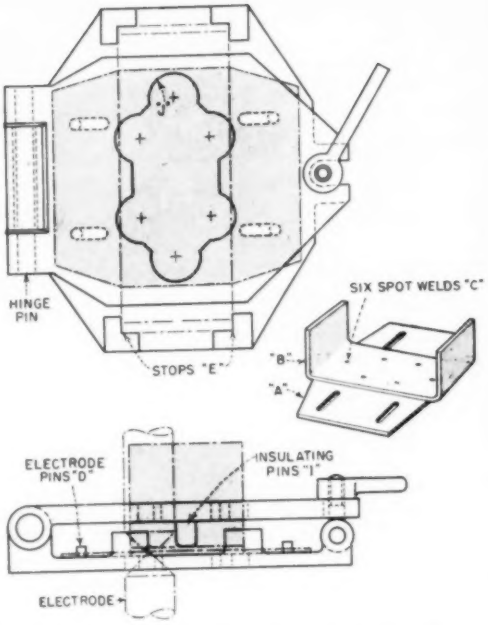


Fig. 1... Spotwelding fixture for fractional-hp motor base locates two parts for welding and also locates position of the six spotwelds required. Work is done on standard machine with no changes to electrodes or arms

RULE 5.. *Provide sufficient cross-section to current-carrying members, and run as close to the electrodes as possible. Use a minimum of breaks or connections in the circuit.*

When the characteristics of a welding current are considered, the necessity for this provision is apparent. A welding current is extremely high in ampere capacity and carries from 3 to 20 v, depending on the machine and the job. A pure copper conductor can carry only a limited current (amperes) depending upon its material and cross-section. If the conductors are too small, an excessive voltage drop and increased resistance will result, and the fixture may be useless unless the conductors can be enlarged.

(This material was prepared in cooperation with the Resistance Welding Institute of the Resistance Welder Manufacturers' Association.)

Again, if the current-carrying part of the fixture is built in several sections, the reduced effective current at the weld (losses in passing the current from one section to another) will cause low operating efficiency and high service and maintenance charges.

For purposes of estimating cross-sections, the following current densities (based upon a 50% duty cycle) are recommended:

Rolled copper sections should carry up to 1800 amp per sq in. Cast copper sections should carry up 1500 amp per sq in. Water cooling either of the above will increase its capacity approximately 100%.

Speed of operation (duty cycle) can also be taken into consideration. Low-duty cycle will allow more current to be carried per sq in. of conductor than a high-duty cycle.

Other nonferrous alloys can be used provided the section is large enough. Where breaks or connections must be made, the clamping surface must be at least twice the cross-section, and the surfaces smooth and parallel and solidly bolted together.

RULE 6..*All moving slides, bearings, index pins, adjusting screws and any accurate locating device should be protected from flash.*

This is particularly necessary on flash welders, although on spot or projection welding some flashing is bound to occur, and when as many as 2000 to 4000 welds are made per hr, flashing can cause considerable trouble by getting across insulated pins, causing a direct electrical short, or into slides, making repairs necessary.

RULE 7..*Provide electrode wear adjustment.*

Most electrodes for spotwelding are copper alloy and, after a production run, they may wear down sufficiently so the stroke of the welder will no longer maintain welding pressure contact between the electrodes and the work. They must then be adjusted either by raising the entire lower arm or fixture, or replacing with refaced or new eletrodes. Not only must adjustment of electrodes be provided to maintain constant welding pressure on the work at all times, but stops, gage points and pins must also compensate or be of a large enough surface to gage the work at both the new and old electrode heights.

RULE 8..*Check welding pressure application.*

Because the welding pressure application to a piece of work has a direct effect on the weld, the design of a fixture must take into consideration the following: (a) accuracy in the machine work for projection welding fixtures and electrodes, and (b) elimination of deflection due to the welding pressure, so the upper and lower electrodes are parallel in all planes and remain so when final welding pressure is applied. When necessary to projection weld at a slight angle, the projection should be elongated in the direction of the possible slide that occurs when squeezing for the weld. Flash welding clamps must be so designed as to clamp the work with at least twice the final pushup pressure to prevent possible slippage of work and to insure a good electrical contact. The welding height, or point where the electrode touches the work in rocker arm machines, should be in a direct horizontal line to the fulcrum point of the arm, so no slipping of the electrodes on the work will result when pressure is applied.

RULE 9..*Consider ease of operation and protection for operator.*

As is true of all jigs and fixtures for any machine, ease in loading and unloading must be taken into consideration. One feature of a welding fixture that is not common to other fixtures is that a welding fixture must be designed and built to accommodate the loading of usually two or more separate parts that become, after welding, only one piece that must be unloaded. Care must be taken that a welding fixture will unload properly when the parts are welded. The danger to the operator when loading and unloading fixtures, from the standpoint of electrical shock, is very remote provided there is no primary short in the machine. The secondary, or welding current, is of low voltage and is entirely safe even though the secondary circuit is unprotected. However, for the operator's protection only one side of the secondary circuit—either above the top electrode arm or below the fixture base—should be insulated from the base of the machine. The welding machine should also be grounded, so, if a primary short develops in the transformer or controls, it will be positively grounded through the welding machine and not through the operator—as would be the case if both sides of the secondary circuit were insulated from the machine base and the operator were touching both upper and lower electrodes or electrode supports. Further protection for the operator's hand should be taken into consideration by providing guards on hand-loaded electrode dies. Use of two hand-operated control switches is a simple method of insuring absolute safety.

RULE 10..*Be sure the fixture is suited to the job and the machine.*

As stated above, all phases of possible welding operations should be considered, as well as the machine to be used and the number and size of pieces to be welded. All have a direct bearing on the type of fixture used. When the method of welding is determined, time should be taken to completely check the parts to provide for sufficient electrode surface and clearance. Be sure the welds are in the best possible position, the stock specified is weldable, provisions are made for clamping and gaging, allowances for flash included, and correct size and shape of projections, or correct amount of lap, are used.

To determine this, sample welds should be made, preferably on the machine to be used. Welded samples should always be made and tested before fixture design is started.

RULE 11..*Provide sufficient water cooling.*

This rule is usually neglected and brought to attention by overheating, excessive electrode wear, transformer burnouts and other troubles.

On a high-production job where electrodes weld with each stroke of the machine, running continu-

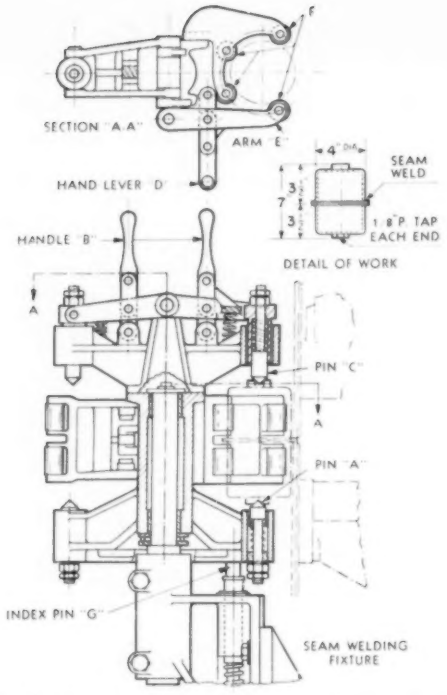


Fig. 2... Seam-welding fixture, two-station type, for welding two halves of a container by means of integral flanges. High production rate is obtained by loading one side of the fixture while work is being welded on other side

ously, an individual water line should be provided for each electrode. A sight drain pot should be provided and inspected frequently to insure a flow of cool water. Regulating valves should be provided to prevent waste. The flood system of a constant external flow into a drain pan is highly efficient, particularly for seam or line welding. Cooling through troughs cast in the sides of the fixture support provides more cooling surface than a drilled hole. Cast-in pipe or tubes in copper castings should be used where various angles or bends of the cooling paths are necessary.

In the case of small jigs to be handled frequently, there should be several provided so they will be used at adequate time intervals to allow them to cool sufficiently between welds to permit handling. Welding completely under water is always possible but care should be taken to provide a suitable water container to prevent water splashing over on the operator or floor. Also make sure that the work and water are clean, preventing dirt or foreign matter from being carried into the fixture and clogging up the faces of the electrodes or contact surfaces. Welding under water has been found a decided advantage in seam or line welding of small diameters where sufficient water cooling could not be provided in the lower arm because of work clearance. Also in the dial feeds for projection welding, this method has simplified water circuit layout.

RULE 12.. *Provide knockouts or strippers.*

In a fixture for heavy welding when the stock may not always be clean, there is a tendency for the work to stick to the electrode faces. This should be taken into consideration where progressive jigs are used, also when automatic or quick loading and unloading of the work is desired. Knockout pins, operated through a leverage advantage or by an air cylinder, or a positive stripper, save considerable production time and add to the operator's protection.

RULE 13.. *Stationary parts of the fixture and work affected by magnetic field of machine.*

The magnetic pull of a welding machine toward the transformer is frequently of such intensity as to lift small pieces of work out of their locators, and small eccentric clamps made of steel, when sufficiently close to the loop to be affected, are sometimes actually released by this force. Workholding plates and clamp handles of nonmagnetic material will prevent this condition.

Practical Examples

The above are general rules applying to most fixtures for resistance welding. It would be impossible to cover in detail the design and operation of flash-welding clamps and fixtures, projection welding fixtures and locators, etc., because each job has its own characteristics and application. There are, however, several problems that would result in a ready solution if the less familiar methods of welding were better known. These include series welding, indirect welding and multiple spot welding, any of which can be applied to a standard welding machine, or at least to a fixture designed with one of the above methods in mind.

Some clarification of the regulations listed may be effected by illustrating, diagramatically, some of the more common fixture setups now being used in various industries for a variety of problems.

Spotwelding Fixtures

In Fig. 1, the two parts A and B are to be welded by six spots at C. The jig consists of a base and a hinged top plate. Part A is loaded into jig when open and located by placing slots over the four insulated pins D. Part B is then loaded by placing it between stops E. Jig is closed and locked by handle G, and insulated pins I hold part in place. The jig is picked up bodily and placed over lower electrodes which, for each spot, fit radius J. The irregular contour of this hole is in both top and bottom parts of jig.

In many cases for an operation similar to this, two or more jigs are used so a helper can unload and load while an operator welds the parts.

Seam-Welding Fixtures

In the fixture of Fig. 2, the lower half of the work is loaded on pin A and the upper half directly on top, with flanges together. Handle B is then raised and top pin C holds the top half in place. Both locating pins are spring mounted. Hand lever D closes

the roller arm E to a definite stop and rollers F maintain concentricity of the two halves during the welding operation. Welding rolls and portions of the welding machine are shown in dotted lines. The entire fixture is mounted on a slide with an adjusting screw and can be raised or lowered to compensate for roll wear.

The two stations are rotated by hand, and through a foot-operated index pin G are located in welding position. This treadle is also arranged so it automatically starts the welding sequence when the index pin locates the station, the welding sequence being the lowering of the upper welding roll which is driven and which in turn revolves the work, completing the seam weld. The operator, then ready for indexing to opposite station, presses the treadle which breaks the welding circuit and raises the upper roll. The fixture is for mounting on a standard circular seam welder.

Flash and Butt Welding Fixtures

The flash-butt welding fixture illustrated in Fig. 3 consists of a left-hand die mounted on the usual stationary platen, a center gage for alignment of the two halves, and the moving platen die. Both dies are split and hinged completely open for loading and unloading.

After placing the two halves of the work in the dies, these are swung shut but not locked. Handle A then moves the left-hand dies against the center gage B, straightening the toggle links and squaring up the work. Handle E is then turned 90° and this half is locked through a T-clamp F. The moving platen is then moved against the center gage B and when the work in this die is squared up it is clamped. Center gage is then raised and the two halves flash-butt welded together.

In flash-butt or upset-butt welding the clamp assembly incorporates the special fixture requirements. Flat, round or irregular shaped work can thus be located and clamped with clamp assemblies specially designed for the particular work.

Automatic Dial Feeds

Fig. 4 shows a section through an 8-station dial driven by a roller chain from welder clutch box to sprocket A, thence through bevel gears B and Geneva drive C. The main spindle D is copper, and commercial alloy copper is used for bushings and contact plates E. One contact plate is fastened to

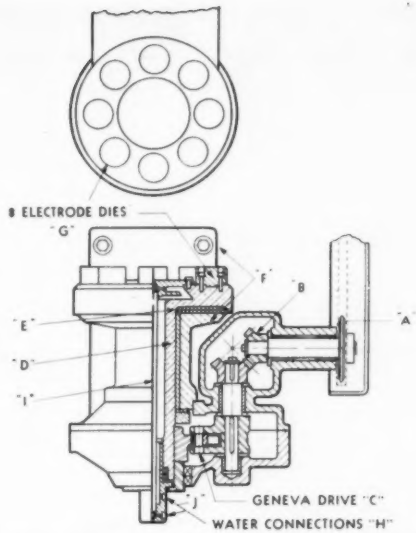


Fig. 4... Automatic dial feed for high-production work is mounted on the front of a motor-driven spot or projection welder and is driven by a shaft extension from the welder clutch box through a roller chain

the revolving spindle and one to the copper lower support casting F by flat-head screws. Lower electrodes or dies G are simple in construction and wear space is provided. The water connection stuffing box H provides for water cooling through inlet I, through center tube, around inside of the dial and return through outlet J.

Generous lubrication is provided between the contact plates and spindle and bushing. The casting F is directly connected to the welding transformer and the welding current passes through this casting into the lower electrodes, through the contact plates E, thence through the work to the upper electrode and back to the welding transformer.

The dial illustrated is for rather light duty. For heavy-duty welding the same principles apply, except that a more generous water supply should be provided by means of an outer aluminum cover and top plate completely flooding the dial surface with water, and various dial-actuating devices to suit the size and speed of the dial should also be provided.

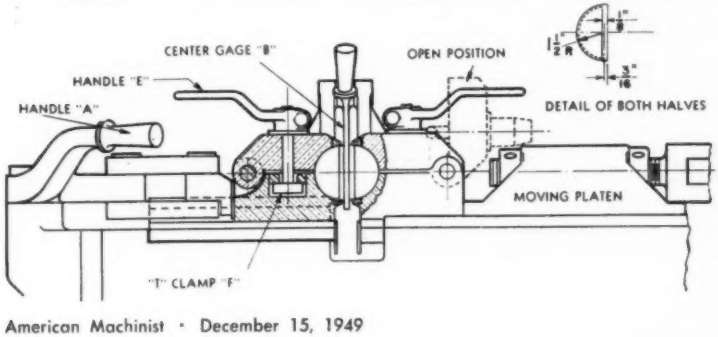
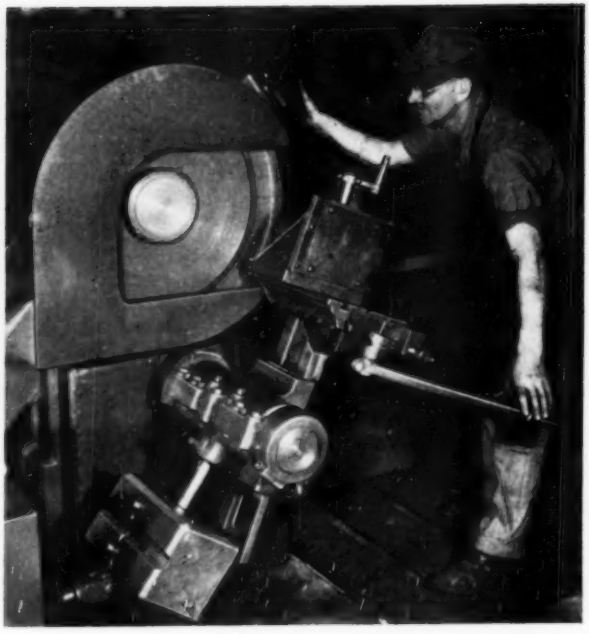


Fig. 3... Flash-butt welding fixture for 3-in. dia spherical shell designed for use on a standard hand-operated flash welder. Both halves of the work are identical and proper allowance must be made for the upset

Disk-grinder fixture adapted for small milling jobs seats parts square to cutter face on standard grinder table. Part here is aluminum-alloy valve tiller



Automatic feed cycle moves table up to vertical position while operator swings hand lever to move worktable closer to cutter. Operator's right hand hits button to start feed

DISK GRINDER FACE-MILLS SMALL PARTS

Converted Besly disk grinder with a cutter in place of the usual grinding wheel eliminates normal grinding before lapping for high finish

BY JOHN C. HANNA, Vice President
HANNA ENGINEERING WORKS

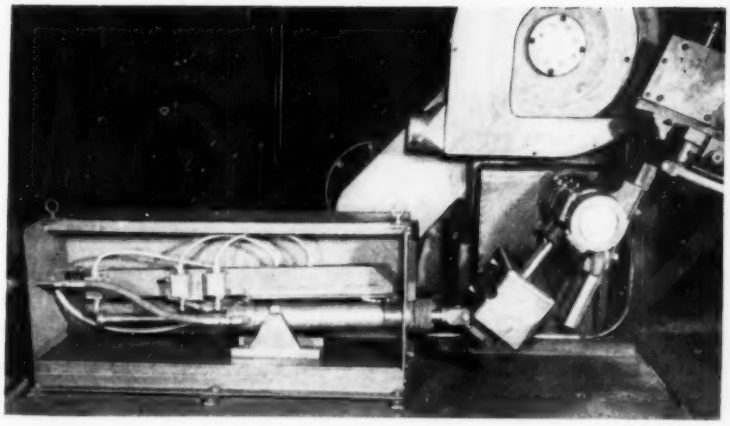
UNUSUAL tooling on a standard Besly disk grinder produces small brass, bronze, and aluminum-alloy parts for valves at a fraction of the cost of conventional production. Quick-acting fixtures that have interchangeable faceplates with clamps formed to fit the parts are one reason for increased production. Another is that the precise milling operation eliminates one grinding job on each part. Still a third is the fast cycle of the machine, which is partly hydraulic, partly manual.

Relatively inexpensive changes were required to convert the grinder into a miller. The hydraulic cylinder with valves and switches was installed at the left-hand table of the machine to connect to the table mechanism near the counterweight. The cylinder feed was controlled by a starting and stopping switch near the operator's right hand.

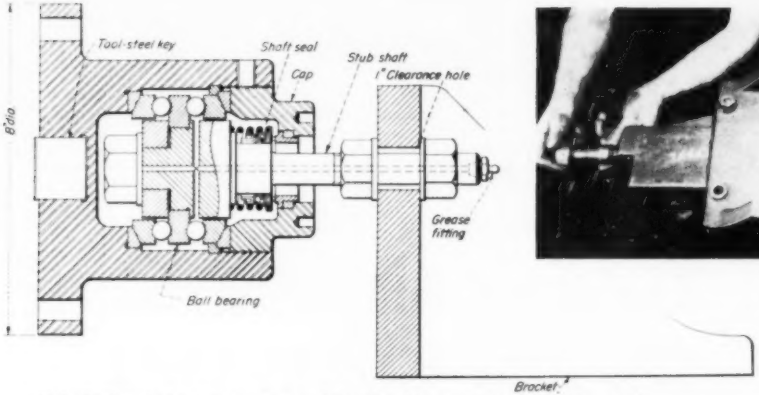
To handle the extra axial load caused by the setup as a milling machine, an extra bearing had to be added to the opposite end of the machine spindle. This was a double-row type that was installed to transfer part of the load from the spindle to the right-hand table.

Round castings that are machined into valve disks are held in a pot fixture that can be removed to hold the parts for precision boring operations at another machine. Disks up to a 3-in. dia can be handled. Two cutter-blade styles are used—but both have 6° clearance angles, although their profiles differ. Two cutters are normally kept on hand; one with each kind of blade inserted so any job can be handled in a minimum of setup time. Back-off screws under the blade permit close adjustment of their projection.

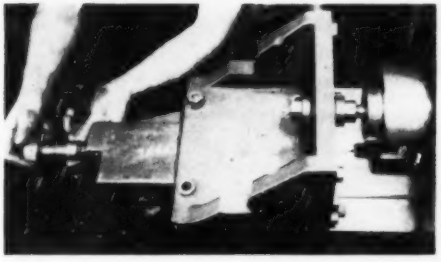
Normally the right-hand grinding wheel is left in position for a standard grinding setup. If necessary, the milling cutter can be detached and replaced with the old grinding wheel for regular work.



Hanna hydraulic cylinder (21-in. dia, 16-in. stroke) controlled by limit switches and solenoid valves rapid-traverses table up, slow-feeds for cutting, and rapid-traverses back

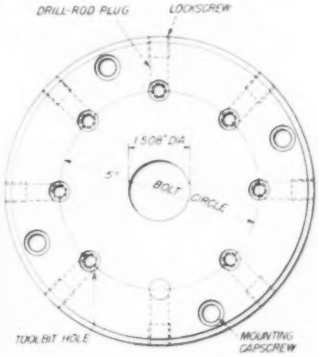


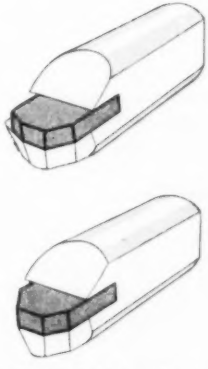
Stub shaft locked to angle plate on left-end table supports inner races of the double-row bearing while housing that fits outer races fits grinder spindle



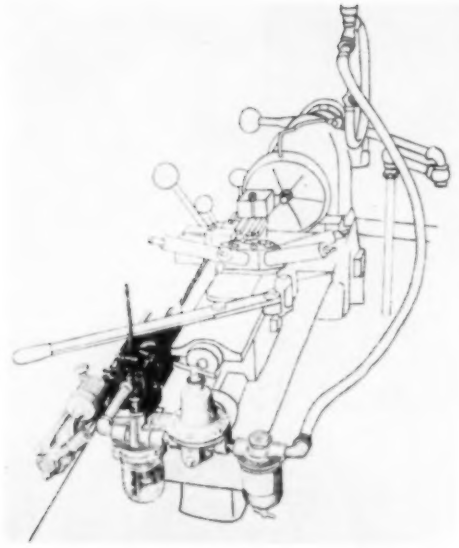
Thrust bearing at left end of grinder spindle is set up for milling job to take extra load. Precision setting screw at left is adjusted to locate bearing exactly.

Milling cutter is attached to left-hand end of grinder spindle with four ½-in. socket-head setscrews. Cutter body is removed from spindle for blade grinding in special bench machine

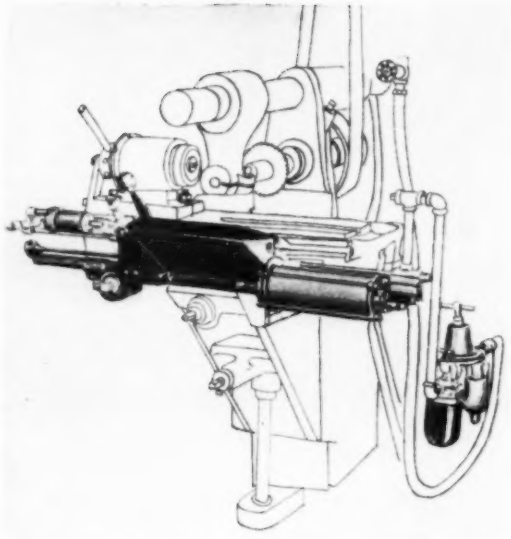




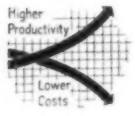
Carbide bits are held in cutter body by steel plugs and screws. Upper bit is for facing bronze disks and aluminum parts, lower bit is for brass stems



Facing operation is performed on a record changer turntable by using an air motor to feed the facing tool while operator uses the turret to spot, and rough and finish ream center hole. Hydro-check insures accurate control of feed, and production is doubled



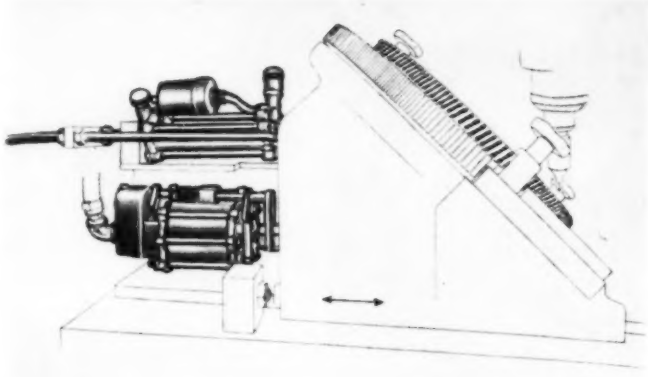
Controlled air power applied to the feed of an old hand mill provided rapid return and smooth, even feed for slotting ends of Armco iron studs. Studs are ⅜ in. in dia and ⅞ in. long, and slot is ⅛x⅛ in. Production was doubled and tool life increased 25 to 35%



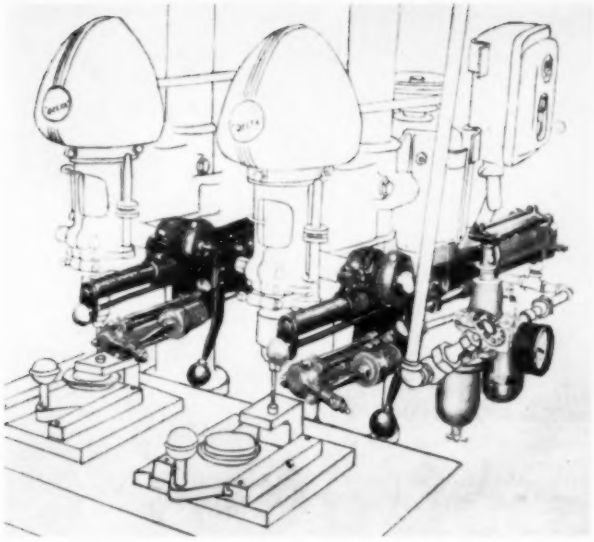
Controlled Air Power
CUTS MANUFACTURING COSTS

BY J. G. McCOMB, Project Engineer
THE BELLOWS CO., AKRON, OHIO

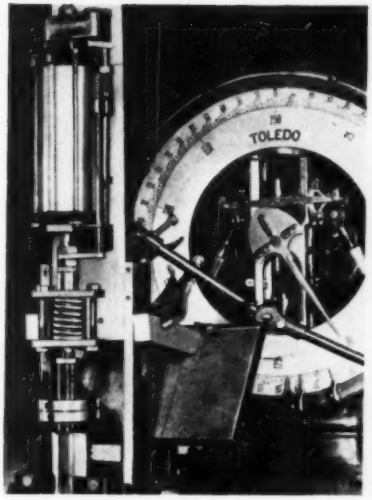
REDUCTION of repetitive manual operations, without the investment required to install expensive, automatic machine tools, is one of the greatest problems in modern, efficient production. Compressed air provides the answer in many cases, and the utilization of controlled air power through comparatively inexpensive devices enables many manufacturers to do work faster, safer, with less worker fatigue (hence, improved morale) and with production costs cut to one-half of former figures.



Manual chamfering of internal gear teeth produced 2 pieces per hr. Air-powered fixture stepped up production to 12 pr hr, and one operator handles 5 fixtures. Cutter is lowered to micrometer stop and fixture traverses work past it. After each pass work indexes automatically



Labor costs were reduced 65% and production increased 50% by one girl operating two drillpresses to ream two small holes in a zinc die casting. Operator merely loads and unloads fixtures and trips air-feed operating levers. Air-powered Hydro-check checks reamers during cutting stroke



Continuous-acting air motor permits rapid testing of springs. Operator loads with one hand, unloads with the other. Overtravel unit, consisting of a spring inserted between the piston rod end and the rack, permits ½-in. overtravel to allow indicating needle to steady itself

VACATION PLAN GIVES CREDIT FOR LONG SERVICE

BY BEN C. BROSHEER, Associate Editor
American Machinist

DAVE DONIGER, who has the longest service record of any shop employee at Snow Manufacturing Company, this summer received credit for six weeks and four days of vacation with pay. Carter Halverson and Charles Seaholm, with the two next-longest service records, had vacation credits of more than five weeks each.

These exceptional credits resulted from Snow's unusual 25-year-old vacation plan. All shop employees receive a minimum of one week's vacation with pay, plus one day for each year of service after the first year. Thus, an employee with three years' service receives a vacation of one week and two days. Office employees receive two weeks vacation, plus one day for each year over five.

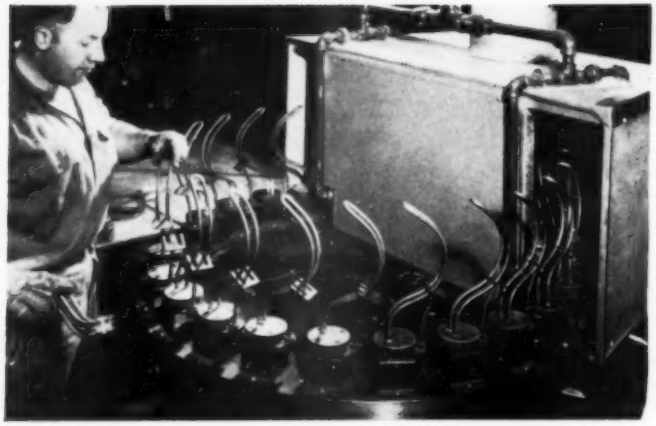
The plant closes each summer for two weeks and most employees take that time for vacation, even if their credits do not add up to the full two weeks. However, Herman Goldberg, Snow's president, makes it a point to have someone from the management staff on hand if anyone whose vacation credit is less than two weeks wants to work during his unearned vacation time.

Few employees having long service records take more than three to four weeks vacation during the year. These employees are expected to take two of their vacation weeks while the plant is closed, but they can use their other vacation time whenever they wish during the year. If they elect to work instead of taking all of their credited time, they are paid extra for the vacation time they do not use.

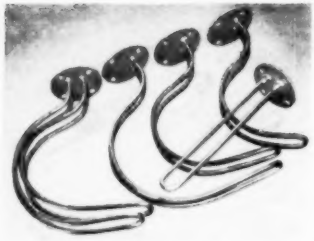
Work is a bit slow after the shop reopens at the end of the regular vacation period, because many of the employees with more than two weeks vacation take at least some of their extra time. However, improved morale more than repays the company for the minor disruptions in production schedules.

Snow's 1949 Vacation Schedule

NUMBER OF EMPLOYEES	VACATION PERIOD WEEKS	DAYS
1	6	4
1	5	3
1	5	1
1	4	1
1	3	3
1	3	1
1	2	4
6	2	3
6	2	2
3	2	1
10	2	0
11	1 to 1	0 to 3



Gas-fired automatic brazing machine increases production of Corox electric water heater elements almost three times over hand brazing. Four different sizes can be handled on 24 interchangeable fixtures. Table speed and brazing temperature can be varied by operator to suit conditions



Water-heater elements are brazed to brass mounting plates on automatic machine developed by Westinghouse. Machine is heated by natural gas and has reduced manufacturing costs by increasing the production rate and reducing the amount of solder needed

AUTOMATIC BRAZING MACHINE TRIPLES PRODUCTION

Heated by natural gas and using preformed silver solder rings, turntable machine cuts assembly costs of electric water heaters

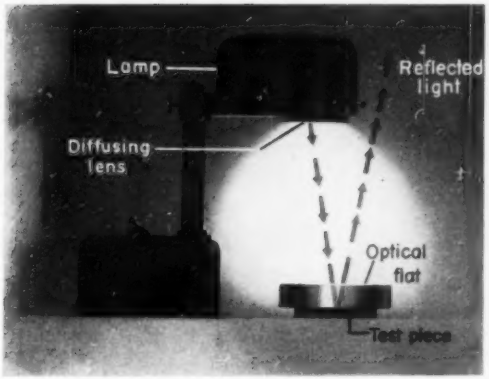
BY FRED GANDERT, Welding Engineer,
Mansfield Works, WESTINGHOUSE ELECTRIC CORPORATION

PRODUCTION costs frequently can be reduced by constructing relatively simple, inexpensive special devices which make manufacturing operations easy to perform at higher rates than previously were possible. A good example is the continuous automatic brazing machine recently developed and installed at the Mansfield Works of Westinghouse Electric Corp. for joining copper tubes of Corox water-heater elements to brass mounting plates. With this machine, one operator now brazes 120 elements per hr, where formerly 45 were produced per man-hour with hand-torch methods.

The brazing machine, which cost approximately $1800, consists of a 48-in. dia rotating table on which are mounted 24 work locating and holding fixtures. Adjustable-speed drive provides range of 6 to 30 ipm travel through heating compartment. Operating speed is dependent on type of heater being brazed, and can be adjusted quickly by the operator.

Premixed natural gas provides brazing heat. The gas is fed into a venturi with 14-psi air pressure. The mixture then goes into two 1½-in. dia pipe manifolds mounted inside an asbestos-walled compartment and equipped with 36 equally spaced ½-in. dia stainless steel burners. Volume of flame can be adjusted by raising or lowering pressure of air admitted into the venturi. Fumes and excess heat are drawn from asbestos hood by small fan and exhausted through a stack to prevent their escape into the shop.

Special fixtures which accommodate the four sizes of heaters, with straight or curved tubing, are interchangeably mounted on fixture supports equally spaced around the steel table top, and locate and hold the tubes in proper relation with the 4-in. dia, ⅛-in. thick brass mounting plates to which they are to be joined. A preformed ring of 0.047-in. dia silver solder wire is placed on each end of the tubing to be brazed into the plates. Flux then is applied to the tube ends, attention being given that it is confined to the proper area. If the flux then is permitted to dry, it aids in holding the solder ring on the tube while it is being loaded into the plate. This assembly is placed on locating pins in the fixture, and the heater tubes are held upright by the vertical rod and grooved plate which is an integral part of each fixture. One operator loads and unloads the heater assemblies as the rotating table carries the fixtures past his working position.



Optical Tools

FOR SHOP PRECISION

BY CHARLES EMERSON
Assistant Editor

WHEN light passes through a homogeneous medium such as air or optical glass, it follows a straight line. If all of the medium is of the same density, the line is the straightest possible—straighter than any line can be drawn with purely mechanical means. This property makes light energy the best possible equipment for a shop that has to do gaging, inspection, and measuring down to a few millionths of an inch. Positive accuracy can be held when light is refracted—when optical flats or a spectrometer are used—or when it is employed to form an image—with microscopes, enlargers, and comparators. Because of light's consistent performance, it offers no important problem to the man in the shop except for his decision as to which optical instrument is best suited to do the critical job at hand, and his choice depends on how the instrument works

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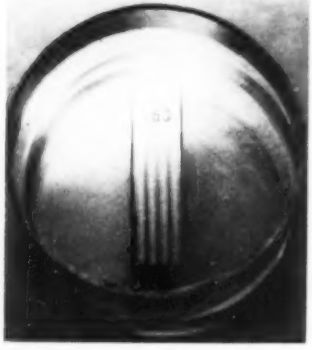
Optical Flats

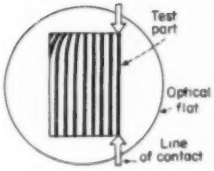
THE MOST basic optical tool is the optical flat—a simple disk made of high-quality quartz glass that has been ground on both sides to as near perfect flatness and parallelism as it can be made. Normally an optical flat is within a few millionths of perfect flatness.

Flats depend on the action of light-wave interference for their value as inspection tools. Aside from involved explanations as to how and why interference works (and not all explanations agree), the effect can be illustrated by a simple checking setup. The necessary elements are an optical flat, a light source, a small part that is to be checked, and a flat plate or another optical flat on which the part can be set.

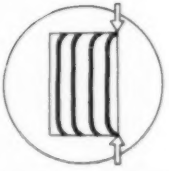
If the flat and the part are clean, and the observer views the reflected light from a point above and almost in line with the light, a series of parallel shadow lines (or *fringes*) will appear when the flat is pressed down so it contacts one edge of the part. Although the flat may appear to be level and in close contact with the full surface of the part, there will actually be a thin wedge of air present between the bottom surface of the optical flat and the top surface of the part. The end of the wedge is along the line of actual contact between the flat and the part, and its thick side is at the opposite edge of the part.



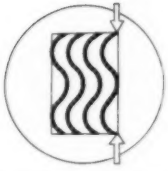
Perfectly flat block between two optical flats shows straight, parallel fringes. Air wedge is formed even without pressing on flat



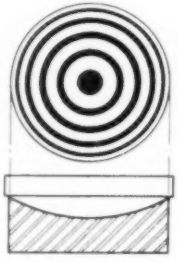
Low spot at one corner of block under optical flat shows up like a hillside on contour map. Straight fringes indicate flatness otherwise



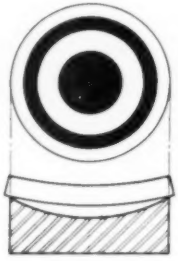
Low top and bottom edges are indicated by fringes that curve toward line of contact near top and bottom, but straight in middle



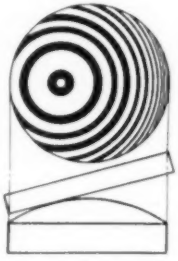
Pattern here shows block to be about equally high at edges and in middle, but two ridges show up parallel to each other



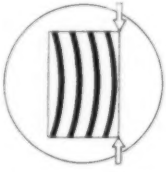
Concave and convex surfaces are identified by concentric-ring pattern. Pressing down on



center of optical flat brings rings toward center if surface is concave

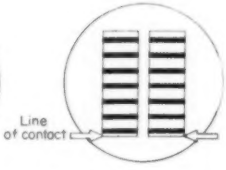


Convex surface remains unchanged when flat is pressed in center. Rocking flat shifts rings



Parallel curved lines indicate the block under the flat to be hollowed out in the middle, with edges high

Irregular pattern indicates two high spots (circles) separated by a diagonal valley across the part's surface



Parallel blocks check when fringe patterns are parallel and aligned when line of contact is shifted

This wedge can only be removed by wringing the two pieces together, but this procedure is unnecessary and not even desirable. It would reduce the number of fringes, and possibly eliminate them; but the fringes must be seen if accurate observations and measurements are to be made. Therefore, optical flat observations are made with the flat held firmly against one edge of the part being checked—just to insure that fringes are seen.

Fringe Patterns

When a perfectly flat part is viewed under the optical flat, parallel fringes will be observed;

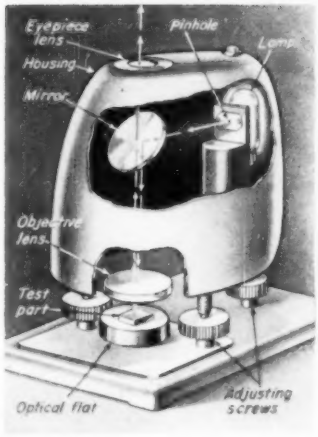
but if the part is not quite flat, the fringes will form an uneven pattern or a combination of patterns. For example: a part that has a low corner, but is otherwise flat, will show a set of parallel fringes except over the low corner. Here the fringes will curve away from the low spot—much like the contour lines on a military map. Like the lines on a contour map, the dark fringes on an optical-flat pattern follow points of equal height—or, to be more exact—points equally spaced below the bottom surface of the flat.

Monochromatic Light

Although practically any kind of light source will show up fringes if the part under observation has a fine finish, only light with a definite and known wavelength is suitable if any measuring is to be done. Such a monochromatic light can be produced with vapor lamps using helium, cadmium, or sodium. Once the wavelength of the light being employed is known, calculations to obtain the depth of low spots in a test part can be made by interpolating the fringe patterns into wavelength values, then substituting the wavelength.

Fringe Measurements

If even a flat part will show a fringe pattern under an optical flat, variations in the pattern from the normal series of parallel lines will indicate variations in the surface of the part. Because of light-wave interference, the light from the source reflects back to the viewer's eye from both the bottom surface of the optical flat and the top of the test part. At a point where the space between these two surfaces is exactly equivalent to half a wavelength (11.6 microinches if the light is a helium-vapor lamp), a full wavelength, 1½, 2, 2½ wavelengths and so on, a fringe will be formed. Therefore at each place where a fringe is visible, the separation between the two surfaces is 11.6 microinches, 23.2, 34.8, 46.4, or some other even multiple of 11.6 Assuming that the two surfaces are together on the line of contact, the first fringe will appear where the test part is 11.6 microinches below the flat, the second where the test part is 23.2 microinches below the flat, and so on.



Interferometer setup is made with objective lens instead of optical flat. Test object is supported level on an optical flat that rests on a plate

If, for example, a test part shows a pattern of curved lines that indicate the middle of the part is low, and the fringes bend about half the lead of the normal fringe pattern, it can be assumed that the middle of the flat is about half of 11.6 microinches low. This amounts to 0.0000058 in. depression at the center of the part's surface.

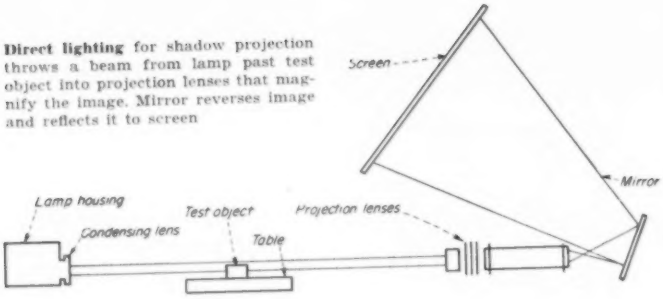
Similar measurements can be made with any pattern. In each case, it is assumed that a normal pattern will show a number of parallel lines, so the amount of depression at one point can be found by counting the number of fringes over to a spot that is in the normal pattern, and then multiplying by 11.6 microinches (or whatever the constant for the light source is).

Odd patterns that show the test part to be irregular can be interpreted by determining the high points. This is done by prodding the optical flat around. The pattern at the high points will remain constant—as long as the flat is in contact—while the pattern over the low spots will change. The difference in height between the high points and the low ones can be found by counting the number of fringes down to a depression and multiplying by the wavelength constant.

Optical-Flat Applications

Gage blocks may be checked against one another, or against a master block, by placing two blocks on an optical flat and then placing another flat on their top surfaces. In this case the two blocks should be wrung to the surface of the lower block to insure that they are both square and flat against it. If the blocks are of equal height, the patterns will show parallel and will match against each other. An additional check can be made by holding the top flat in contact on a slanted line across both blocks. In this case, too, the fringes should be parallel and should match. Non-parallel fringes show the flats are not level.

Body heat, from the operator's fingers, can warp an optical flat slightly. To avoid this effect, an interferometer can be utilized. It is simply a fixed optical-flat setup. The instrument houses a mercury lamp, a half-silvered mirror mounted at a 45° angle, a plano-convex objective lens that is flat within a millionth on its under side, and an eyepiece lens. Light from the lamp goes through a pinhole, reflects down from the mirror through the objective lens, and reflects off the test part (which is under the lens) up through the mirror and eyepiece. Once the objective lens has been leveled by adjusting three leveling screws (using an optical flat as a test part), work to be inspected is placed under the lens. A green filter over the eyepiece passes only light with a wavelength of 21.5 microinches, so sharp green fringes are seen. In case the test part being inspected is small, it can be located on the optical flat, which would level its bottom surface. Only clean optical surfaces and polished and clean test surfaces will produce fringes that can be counted with reasonable assurance of accuracy. Flats should be kept in a dust-free container, and should be wiped with a fine brush before and after use. Best results are obtained when flats are employed in a room where the temperature and atmosphere are fairly constant, and, for the same reason, when as little handling of the flats and parts as possible is allowed.



Direct lighting for shadow projection throws a beam from lamp past test object into projection lenses that magnify the image. Mirror reverses image and reflects it to screen

Optical Projection

SHADOW projection has been in use as an inspection method in machine shops and toolrooms for many years. The first projector was marketed about 30 years ago. Unfortunately it has been only recently that optical systems, light sources, and staging fixtures have been sufficiently developed that the old-time hoods and screens could be discarded. New projectors (now usually called comparators) are capable of giving good performance when installed on production lines in full room light. Rapid, close inspections of parts ranging in size from watch cogs to large gears can be made under conditions and in places where a machine tool will operate.

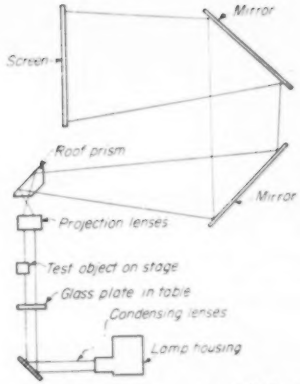
Lighting and Lenses

A limiting factor of magnification is light intensity. Although a few projectors are equipped with a variable light source that can be increased in intensity as magnification goes up, most sources are fixed. It follows that as magnification increases, the amount of light and shadow showing on the screen is reduced until definition of the shadow will be insufficient for practical purposes. For this reason it is important that the lowest magnification that will show the necessary detail should be employed.

Although optical systems are built with precision, the tendency for lenses to distort non-radial lines at the edges of the field cannot, as yet, be eliminated—although recent advances have reduced this effect to near insignificance. For high magnifications, though, the effect can be eliminated by locating the test object so it will throw the shadow segment that is being studied at the center of the viewing screen. For low-power magnifications — 10X, 20X, $31\frac{1}{4}$X, 50X—this factor can be ignored completely when accuracy is not required beyond tenths.

Screens and Charts

Ground-glass screens can be marked with a fine, hard pencil to

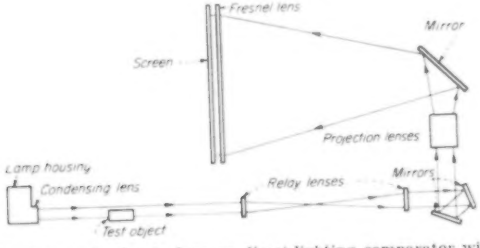


Indirect lighting requires higher lamp power. Beam reflects up from mirror through polished-glass insert in table, past test object, and into projection lenses

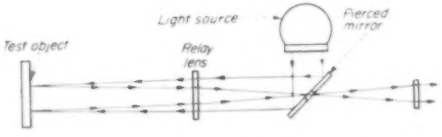
any shapes or reference lines required. In many cases it may be preferable to do this marking in the shop where the comparator is to be employed. However, a variety of factory-marked screens are available. These may have simple centerlines, a few dashed lines aligned at 30° intervals, complete rectangular grids, radius outlines, standard thread forms, or many other common outlines.

While factory outlines are most accurate, they fit only a few of the jobs that a comparator can handle. For specialized comparison jobs, tracings of part outlines or parts of outlines, drawn to the exact scale that is to be employed in magnification—and drawn with good drafting-room accuracy—can be located over the screen and clipped down. These can be made on Vinylite, drafting paper, or any similar non-opaque material.

Commercial charts made for general purposes are graduated in-

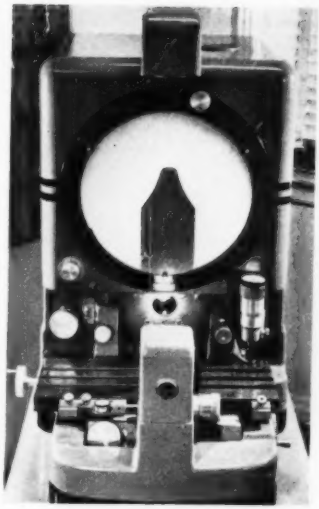


Surface projection is done on direct-lighting comparator with two direction-changing mirrors and projection system vertical under last mirror. Lamp housing is in front of table



Auxiliary light inside housing sends beam to 45° mirror and out relay lens to test surface. Reflected light follows regular shadow path through hole in middle of mirror

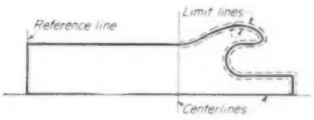
Plug-gage inspection for lead, half angle, helix angle, and three diameters is made accurate by dial-indicator location of stage slide over indirect light beam



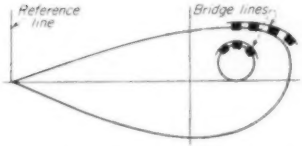
Part-profile check on direct-lighting comparator is handled with stage on table (behind light housing). Handwheels control table movement and dial indicator shows table elevation

to angled lines or concentric circles—usually marked off on two axes on two scales that are multiples of each other. Thus, one chart might have 20 concentric circles or arcs marked off on one axis for 10 magnifications (with each space between circles indicating 0.010 in. on the object) and on the other for 20X (with each space representing 0.005 in.).

Among the more useful screens are those that have angular graduations around their outside frames. A thumbscrew lock permits releasing the screen and rotating it around to bring a vertical or horizontal centerline to any odd angular elevation required. Checks on angles along any edge of the projected shadow can be made with good precision.



Dashed limit lines bracket small part that is located so end butts against vertical reference line, bottom is on horizontal centerline. Profile is inside dashed lines, so part is acceptable



Bridge lines show test part, which is located with tip at reference line and bottom of hole on horizontal centerline, to be within limits at the hole, but not at the critical outside profile

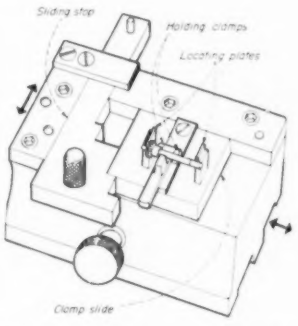
Staging

Although a single outline is sufficient for checking many parts; and for indicating angles on parts like toolbits (checked for rake angle, clearance, and form); measurement with a comparator cannot be handled this way. If a test object is located properly above the instrument table, its outline can be identified within or outside of tolerances by two common methods.

Double lines, spaced apart to correspond to the limits of a dimension on the object, will indicate acceptability if the edge of the shadow falls between them. For this kind of checking, it is common to provide a reference line on the chart which will indicate an edge of the part from which measurements can be made. A simple fixture will locate the part—if it has either a horizontal or vertical edge—so its shadow falls on the reference line and one axis.

The bridge system is another method of identifying shadow edges. Here a solid line follows the outside limit of the test object, while thick dashed lines that are the full width of tolerances are located to touch the solid line. With the bridge system, acceptability of the part is indicated if the part's shadow touches the wide dashed lines, but does not completely fill the spaces between them (does not touch the solid line). If the shadow of the part does not fall within these limits, it is not acceptable.

Since staging for a comparator is a relatively new technique, few

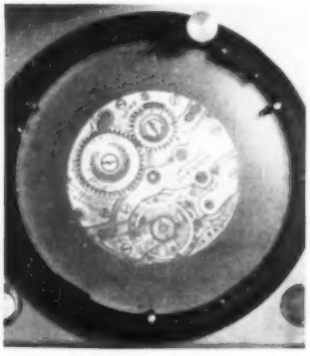


Staging fixture for small pinion has shifting clamp slide. Sliding stop has steps that position pinion in relation to limit lines on chart

commercial stages are available. However, simple stages, like one rotary model that is graduated around its base into degrees and minutes, are made to go with some comparator models. Elaborate staging, while more expensive to set up, pays off by speeding the comparison of a number of outlines and dimensions on the same part against charted outlines located in different places on the screen. Fundamentally, a stage must clamp a test part in focus in the light beam and locate it so edges to be checked are in sharp shadow on the screen. The part should be located positively against one or more stops so a given shadow edge will align automatically with the corresponding outline on the chart.

Multiple inspections with the same chart, stage, and part can be done by moving the table (traversing wheels for three directions are normally provided). In this case some reference mark on the chart in each position must be matched with a reference edge on the shadow of either the part or the stage. Another method is to provide the stage with a shifting slide, controlled with a positively spaced sliding stop, to bring the part image into alignment with its limit markings on the scale.

Auxiliary equipment for tables and stages, such as a helix table that will shift threaded work for profile and angle checks, speed inspection. A special attachment stage for mounting screws with a wide range of diameters and pitches is being marketed, as is a more complicated device made for establishing turbine blades in correct positions for checks of profile at any section along the blade. Vise stages, V-block stages, swivel bases, and fixture bases on which specialized sub-stages can be built are also available.



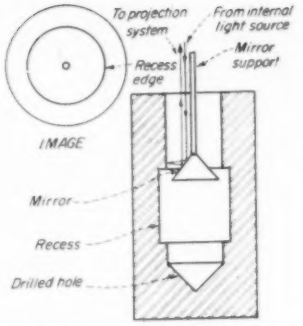
Surface projection of watch assembly (10X) illustrates typical inspection job on comparator. Graduated dial scales permit rotating scribed index lines on screen for checking tool and thread angles

Surface Projection

Theoretically the mechanics of reflecting surfaces to the screen of a comparator offers no more difficulty than constructing a simple microscope, for the microscope accomplishes this effect with ease. Actually, light limitations as well as optical limitations have retarded the development of surface projection until quite recently. The main obstacle was illumination. It was formerly difficult enough to illuminate a test part so its shadow could be seen in a room where normal light existed, but the added burden of lighting up a surface—often one that was so polished that is imperfections were all but invisible—has only been overcome by concentrating light.

With one method, two auxiliary lights are mounted on the front of the comparator, under the screen, so two beams reflect off mirrors onto the surface being observed. Reflected light from the surface then follows the normal shadow-image optical system and is projected onto the screen.

Another system uses a built-in additional light inside the instrument that reflects off a mirror and out to the surface; then back into the regular optical system. The mirror in this case is elliptical shape with a hole in the middle that passes the regular light beam back to the projection lenses.



Internal-recess image is thrown on screen by conical steel mirror inserted in hole. Part is aligned with optical axis and mirror is slid in and out to show internal surface

Deep-hole inspection is possible with the internal-source light, and internal reliefs, counterbores, and chamfers are inspected easily when a conical mirror is inserted in the hole. The mirror spreads the beam from the internal lamp to the internal surface of the hole. The light bounces back to the mirror, which reflects it back into the regular projection system.

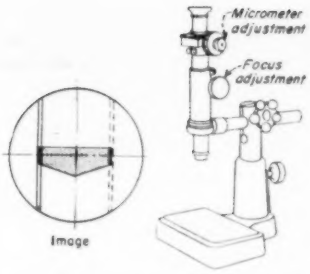
Without the mirror, light simply goes into the hole and reflects off the bottom back into the regular light-beam path.

Optical comparison provides a rapid means of inspecting general outlines and surfaces for conformity, and also an accurate method of measuring dimensions that would ordinarily have to be checked with mechanical means—often more difficult and sometimes doubtful as to accuracy. By far the greatest advantage of projection equipment is that it provides conclusive and clearly visible evidence of the condition of objects being checked.

Shop Microscopes

SURFACE FINISH, small radii and fillets, tool marks, cracks and imperfections, and innumerable minute flaws that cannot be seen or identified with the naked eye are investigated with the aid of shop microscopes. These can range all the way from simple magnifying lenses (loupes) to large and complicated stereoscopic microscopes that show depth as well as height and width.

For routine work, a moderate-power microscope (30X, 40X, or



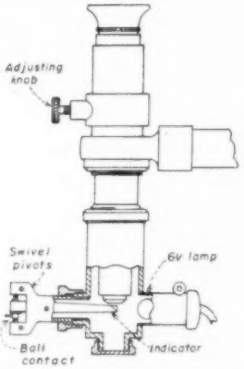
Shop microscope with Filar micrometer on tube allows measuring by shifting cross-hairs and reading micrometer drum. Filar field has centerlines and double vertical line for measuring. Double-line image shifts as micrometer is adjusted

50X) will both give visual evidence of near-invisible physical conditions and allow measurement in a limited sense. Conventionally, a shop microscope has a small horizontal scale that is calibrated to the magnifying power of the lens system. With a scale marked off with a hundred lines, measurements can be easily estimated to 0.00025 in.

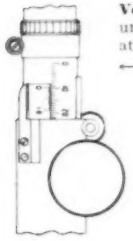
A typical microscopic lens system includes an eye lens, a field lens, and a double objective lens. Physically, the microscope may be fitted with a small housing that will permit carrying it around in a pocket, or it may be equipped with an adapter that will permit its attachment to a number of bases. Racking arrangements for focusing are included with the optical tube.

A Filar microscope is stationary, but has a movable cross-hair grid which can be shifted by means of a micrometer screw on the neck of the instrument. Measurements are made by sighting one line or cross-hair over an edge of the test object, noting the micrometer reading (it can be set to zero), shifting the hair, and again taking a reading. Because this method makes actual measurements of the image—not the test object itself—accuracy is high.

Precise depth measurements can be made with a microscope fitted with a micrometer racking arrangement that acts vertically instead of horizontally. Depending on the lighting and how well focusing is done, vertical measurements can be taken with accuracy up to about 0.0005 in.



Optical indicator shows up elliptical variations on rotating parts by movement of index line over graduated scale on reticle

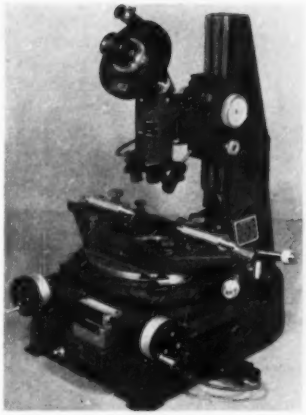


Vertical motion is measured on draw-tube scale attachment

Shop microscope of medium power has simple focus adjustment and internal light supply

Microscope Attachments

Numerous additions to the standard microscope tube are practical if specialized inspection or measuring is to be done. An image inverting prism brings the image to the eyepiece right side up, which may be of help to personnel who use the microscope only infrequently. Illuminators may be added for greater contrast on work that has a low reflection. Micrometer accessories can be added to the eyepiece assembly, and protractors can also be added when angular rotation is desired for checking angles.



Toolmakers microscope with rotary table and centers on stage is equipped for sighting thread-gage profile and helix angle

Dial-indicator accuracy is exceeded by optical indication. For this purpose an indicator can be added to a microscope. An indicator rod has a hardened-steel ball at one end—and a pointer scribed with an index line at the other. Suspension of the lever is by means of two jewel bearings. It can be located to indicate either horizontal or vertical motion.

Toolmaker's Microscopes

Optical comparison of lathe tools, drills, reamers, cutters, gages, templets, dies, and many other toolroom products as well as bench work and production elements is possible with the toolmakers microscope. The object under test is mounted on a traversing stage on the microscope, and can be checked for angles and measurements in any direction. In effect, the instrument is practically an optical comparator without the advantage of the viewing screen. It has, however, advantages over the comparator because of its lower lighting requirements, smaller size, and the fact that a camera can be attached to produce permanent evidence.

Stereoscopic Microscopes

Probably the most useful instrument for studies of surface finish is the stereoscopic microscope. Because two images are formed, the

operator can investigate metal test objects and see a three-dimension image. The image is also upright and not reversed from left to right, so movements on the stage will appear in the image as they really are. Most stereoscopic microscopes have a set of objective lenses (double—one for each eye) in a turret so change from one magnification to another is simple. The range of magnifications common with this instrument is larger than with other equipment—from 6X to 136X.

Primarily the stereoscopic microscope is an instrument for identification—not measurement. The third-dimension feature is helpful for this purpose, making small scratches and depressions in flat surfaces stand out clearly.

Special Purpose Instruments

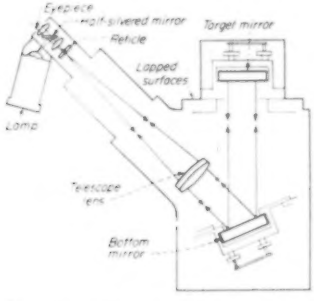
Collimation

Light's ability to travel in a straight line—providing no external sources cause error—allows it to be employed for mechanical alignment. The device is a collimator. Light from a source just below the eyepiece is reflected off a half-silvered mirror and is focused on a reticle—a glass plate scribed with cross hairs. The image of the hairs is beamed down through a telescope lens that forms the light into a straight beam of parallel light, which then reflects off a mirror and is directed straight up.

A target mirror is mounted in a steel disk that has a bottom surface lapped exactly parallel to the mirror. The top surface of the collimator is also lapped exactly perpendicular to the straight beam of light, so when the disk is placed on top of the collimator the beam is reflected back on itself. If the mirror is tipped, however, the reflected image of the reticle will appear at the eyepiece—as well as the real reticle.

If a test object that is hollow and has supposedly flat and parallel ends is placed between the lapped surfaces of the collimator and the mirror disk, non-parallelism will show up because the reticle image will not fall exactly upon the real reticle. If the cross hairs are graduated, this non-parallelism can be measured.

This principle has been used to advantage in England during the war for checking bomb-door alignment on Lancaster aircraft—and with an accuracy of 0.01 in. in a length of 50 ft.



Test object is collimated by inserting it between lapped surfaces of collimator body and target-mirror disk. Adjustment screws at target permit perfect alignment of reflecting mirror

Optics on Machines

Metalworking operations, such as grinding, can be viewed as they are being performed by optical projectors and microscopes that are fitted to the machines permanently. One manufacturer produces a grinder that has an optical system that throws a shadow of the workpiece and the grinding wheel onto an 18x18-in. viewing screen. Magnification can be either 20X or 40X, which allows close observation of the contour being ground, the action of the wheel, and also the condition of the wheel as it rotates.

Another system allows the operator to view the edge of the work and the wheel through a microscope at a 30 to 1 ratio. In addition, a pantograph arrangement allows checking the work against an actual drawing as large as 20x20 in. through the microscope.

Jig Location

For precision boring and grinding, a locating microscope may be attached to the machine spindle. Under a cross-hair field, the workpiece is picked up and shifted into position. Centering is done from accurate layouts or directly with the use of concentric-circle fields.

One new optical development has potential applications on many machine tools. Shown in England only recently, a projection screen is fitted to a boring machine to indicate the relative positions of multiple cutting tools inside the bore. Index marks on the boring-bar support and the carriage indicate the tool spacings.

Small Optical Tools

While large and complicated optical equipment is becoming more and more useful, smaller shop tools that have been in service for years still perform useful functions. Small magnifiers like optical loupes (eye lenses) and hand-held magnifiers allow rapid inspections of freshly machined surfaces and small assembly components. Small mirrors, like those used by dentists, allow inspections of hard-to-reach surfaces. Large-surface magnifiers are now made with built-in light supplies. These can be attached to either a drawing board or right on a machine tool where instant examinations of chips (to check on cutting action) can be made.

We acknowledge *the generous cooperation of the following firms and organizations that made possible the preparation of this report:*

American Optical Co., Scientific Instrument Div.
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The DoAll Company
Eastman Kodak Company
Engineers Specialties Div., Universal Colorplate & Engraving Co., Inc.
The Gaertner Scientific Corporation
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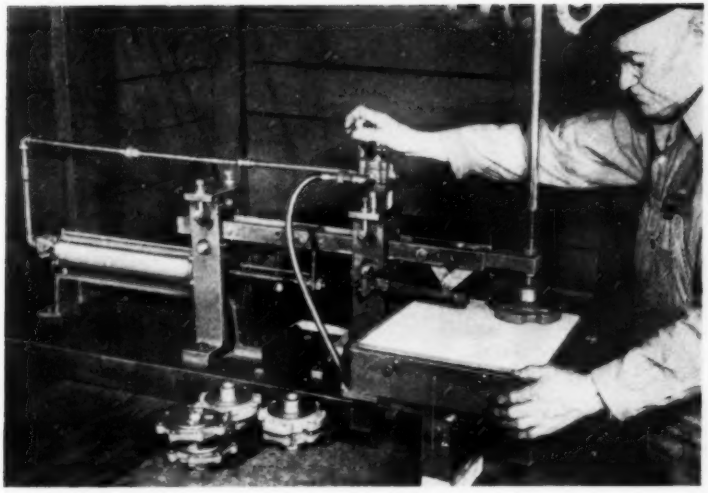
The Moore Special Tool Co., Inc.
The Van Keuren Company
Westinghouse Electric Corporation

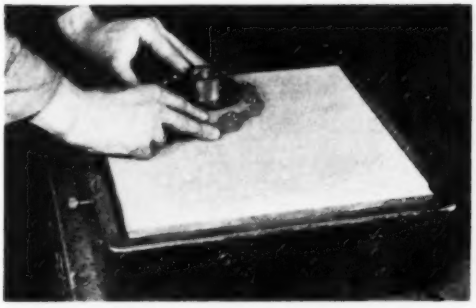


Primary lapping is done with part clamped in air-powered reciprocating arm that has an adjustable stroke over aluminum-oxide stone (left). Vertical rod leads to overhead weights. Stone is traversed under part to present new surface after each stroke. Hook finger acts against 20-tooth plate (above) to rotate part slightly at each stroke of the arm

HAND LAPPING STILL PAYS OFF

Why is hand lapping done nowadays—and how? Answer: Because job-lot valve-bonnet and disk surfaces require precise optical flatness—done with abrasive stones that themselves must be lapped to precise flatness in a modern version of old-time lapping procedure

BY B. M. PETERSON, Methods Engineer,
HANNA ENGINEERING WORKS



Secondary lapping is done with part clamped in fixture on No. 320-grit silicon-carbide stone by hand. Proper finish is determined by feel by experienced operator

NO ONE will claim that hand-lapping methods can be followed for high-speed production; yet mating surfaces for air-control valves must be perfectly flat within one light band by optical-flat inspection. Quantities are small, so disks and bonnets are finished after they have been milled off or faced in a lathe by a rough-lapping operation in a machine, and finally with a hand-lapping process on aluminum oxide and silicon-carbide stones that are 12 in. square and 1½ in. thick, made by Norton.

As in all lapping processes, the actual lapping is less difficult than is keeping the lapping surfaces flat and perfectly finished. The process for dressing the stones involves lapping them on a steel plate with a special abrasive compound, or lapping three of the stones alternately together. No. 1 and No. 2 stones are lapped together, Nos. 2 and 3 are lapped together, and finally Nos. 1 and 3 are lapped against each other. This makes the stones accurate enough to lap the parts, and insures that the three stones are each lapped to a uniform flatness.

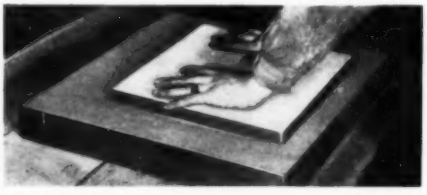
The stones are refinished again and again until they are worn down to a ¾-in. thickness, and are then discarded. The valve parts that are produced are assembled into their valves as soon as possible to avoid any damage during storage.

Final lapping is done on No. 400-grit stones by two operators, one of whom only puts on finishing touches and handles inspection. These stones are dressed by lapping three alternately, one against the other

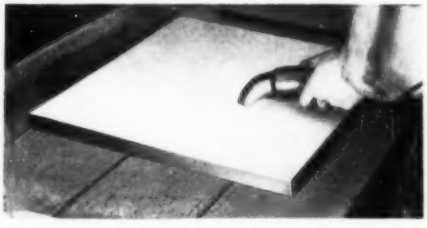
Stones for rough and secondary lapping are removed from cast-iron frames where they are held with setscrews. Redressing is done away from production section so abrasives will not damage work in progress

Clean plate, SAE 1020, is covered evenly with No. 46 silicon-carbide abrasive grit in preparation for lapping the lapping stones

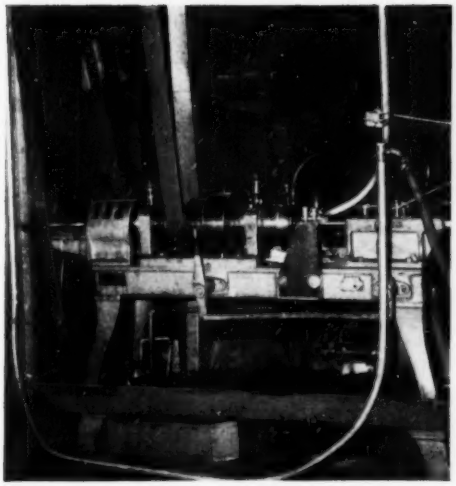
Finished valve-disk and bonnet surfaces are checked with monochromatic light and optical flat to one light band, and with profilometer to 1½ to 3 microinches rms surface. Parts range from 1½ to 4 in. dia

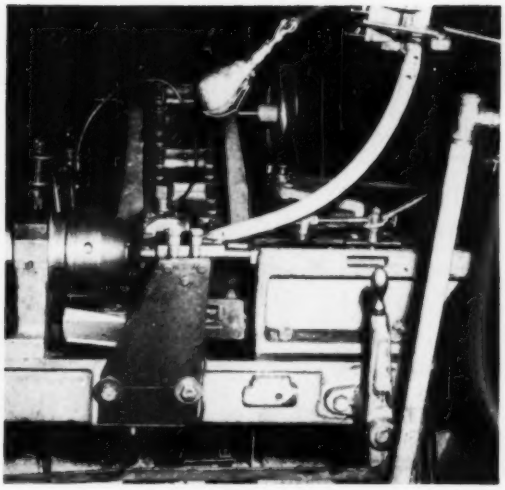


Constant pressure and slow movement of lapping stone across abrasive on steel plate produce true surface. Proper finish is determined by feel. Operator checks stone, when finished, for flatness



Dressed stone is finally cleaned off with suction hose with a flat nozzle and relocated in a cast-iron frame for either the roughing or secondary lapping operation





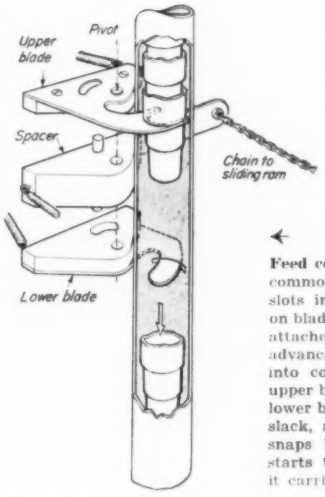
Conduit pipe has open end at convenient height for loading, then loops down and up high above machine to form stack of parts above automatic feeding device. After dropping handful of cups into tube, operator holds hand over tube and light air pressure blows cups around loop to top of stack. Bleeder holes release air behind cup and reduce cup momentum near end of loop. Feed control device drops one part at a time to locating block near cross slide. Cup is inserted in chuck by ram that slides through bored hole in block. Breaking into this hole from above at approximately 10° to horizontal is second hole equal in diameter to inside of stack pipe. Hole enters approximately 20° in front of machine centerline, so pipe is out of way of sliding ram unit. Two small hair springs mounted across open end of bored hole prevent cup, as it is fed down, from sliding out too far. After trimming, cup is ejected by cam-operated knockout, falls down chute, is picked up by conveyor and fed into finished-parts box. High-speed-steel cutters using no lubricants give best results. Carbide cutters would not stand up on this job

PNEUMATIC TUBE FEEDS AUTOMATIC WORK LOADER

BY J. W. HILLHOUSE, Equipment Engineer, Worcester Pressed Steel Co.

A NEW twist in stack feeds is playing an important part in getting more production from an old trimming lathe at Worcester Pressed Steel Company. Installed on a cam-operated Waterbury-Farrel machine, the trick feed completes mechanization on a setup that is giving twice the output formerly obtained from a hand-operated machine.

The trimming lathe, at the time the new setup was made, had a cam-actuated chuck, a cam-actuated sliding arbor to ram the cup into the chuck, and a cam-actuated cutter holder. The part was a small stainless steel fire-detector cap, tapered, and with two shoulders; thus it was feasible to nest the parts one within another in a stack feed. The problem then broke down to three parts: (1) how to get a long enough stack to be worthwhile, (2) how to release one piece at a time, and (3) how to hold a single piece in position for the sliding arbor to pick it up and ram it into the chuck. How these problems were overcome is clearly shown in the illustrations.



Feed control device has three moving parts on common pivot. Hidden pin in spacer engages slots in upper and lower blades, and springs on blades tie blades and spacers together. Chain attached to machine ram swings spacer as ram advances. This causes lower blade to move into conduit just before hidden pin engages upper blade and retracts it to release stack onto lower blade. As ram returns and chain becomes slack, spring swings spacer, and upper blade snaps back into conduit before lower blade starts to retract. As spacer continues swing, it carries lower blade out of conduit

ORDERLY MATERIAL LAYOUT MINIMIZES PRESS-WORK COSTS

Major savings are obtainable by searching for the best way to run the strip, because it affects both the number of blanks and design of the dies

BY J. R. PAQUIN, Tool Engineer
Underwood Corp.

BECAUSE from 50% to 70% of piece-part cost is for material, the procedures employed in laying out the scrap strip directly influence the financial success or failure of press operations. The part must be laid out so a maximum area of the strip is utilized in production of the blank. This blank layout must be drawn before any work is done on the die itself. In fact, the material layout will govern the shapes and sizes of all die members.

Basic Blank Shapes

The shape of most blanks will fall into one of the classifications shown in Fig. 1. The accompanying scrap-strip designs for these typical part outlines provide a starting point in establishing the correct material layout for any part to be blanked. As shown, the scrap strip for a circular blank is laid out for a double row. This is far more economical than a single row and should be specified for all dies except those scheduled for very low production.

Many blanks have elaborate contours that cannot be readily classified. Upon study these will be found to be made up of two or more of the basic forms given. Hence scrap strips for these must take into consideration the particular shape combinations.

Blank Positioning

Parts can be positioned eleven different ways in the strip. Choice of the correct method depends upon part shape, production requirements, and any bends that must

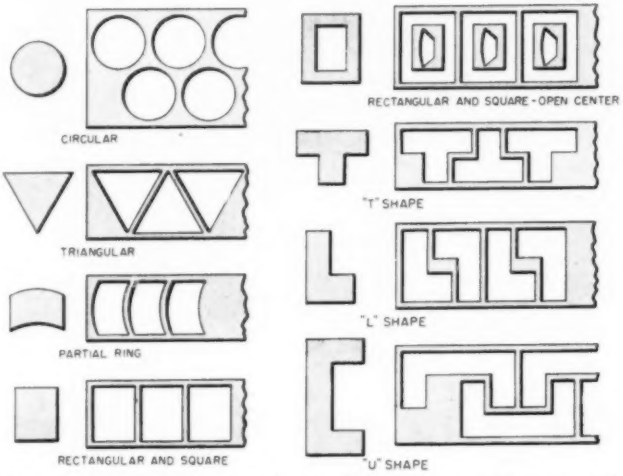


Fig. 1... Blank contours are made up of one or more basic forms, and scrap-strip layout should take into account the particular shape combinations

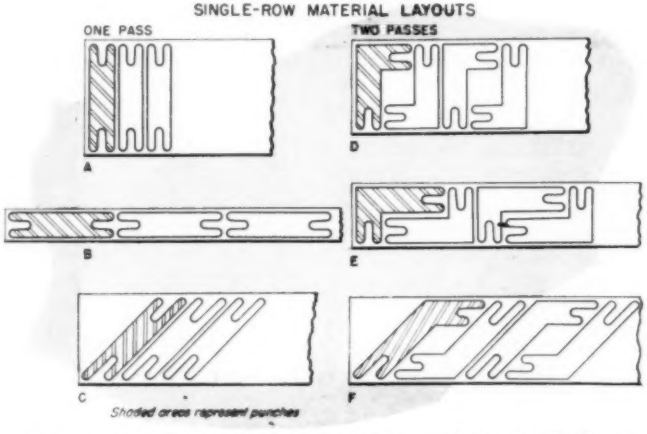


Fig. 2... Blanks may be arranged in a single row and cut out with either one or two passes of the strip through the die. Material savings obtained by the double-pass method must be balanced against extra labor cost

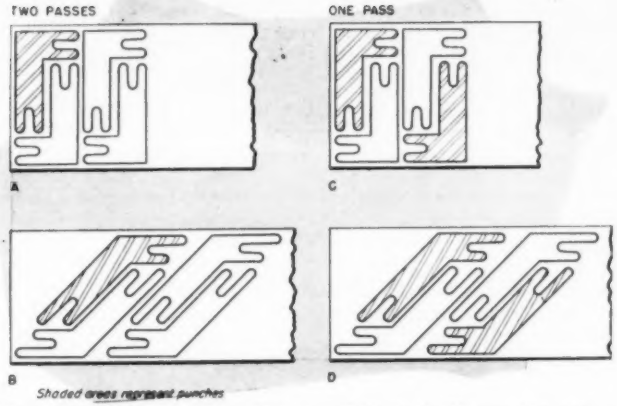


Fig. 3... Greater operating speed is secured by the double-row, two-pass method than by the single-row method. The double-row, one-pass method is even faster because the strip is passed once through gang dies

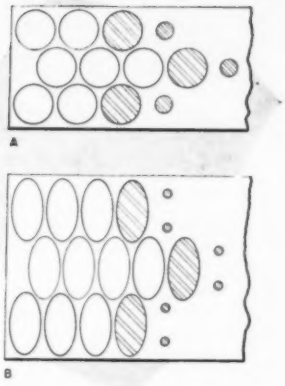


Fig. 4... Triple-row gang dies of the progressive type are rapid producers of washers and similar articles

be applied. Fig. 2 shows the "single-row, one-pass" and "single-row, two-pass" methods. In the first case the blanks are arranged in one row only, and the strip is passed through the die once to cut all the blanks. At *A*, the parts are located in a vertical position in the strip. This is the preferred method where no bends are required, because the maximum number of blanks can be cut from one strip, and fewer strips must be handled.

Where severe bends are required in subsequent operations, as in flat springs made from strip, method *B* must be used. This procedure involves handling more strips to produce the same number of blanks.

Shape of the piece-part will often lend itself to angular positioning, as at *C*. For some contours, this method is economical of material. Also, it has the further advantage of allowing bends to be made without fracture.

An excellent means of saving material is provided by the "single-row, two-pass" method, Fig. 2, when used in conjunction with certain part shapes. In this case, the parts are positioned in the strip in a single row. But alternate blanks are turned upside-down as shown, and the strip must be passed through the die twice to remove all the blanks from it. As the strip goes through the first time, the blanks in the upper row are cut. The strip is then turned over and run through the die again, removing the rest of the blanks.

A 10 to 15% higher labor cost will occur in double-run layouts of the type described. The operator must pass the strip twice through the die and use greater care in gaging the strip. Extra labor cost may be offset by the saving in material.

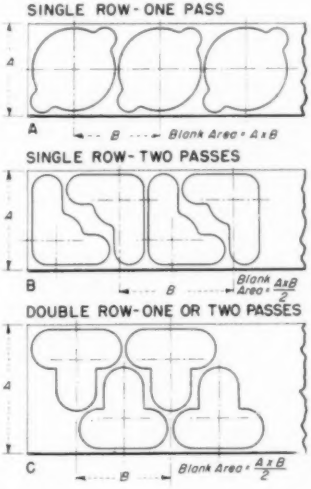


Fig. 5... Blank areas must be calculated for the various positioning methods in order to obtain maximum economy in use of material

Vertical positioning is employed at *D*, Fig. 2, as the means of part location. In this case, it is obvious that horizontal positioning, as shown at *E*, would consume a greater percentage of the strip area. The contour and bends found in many piece-parts will dictate use of angular positioning as shown at *F*.

Further economy in material can be achieved by use of the "double-row, two-pass" method shown in Fig. 3. Here, the strip is run through the die twice, but blanking centers are much shorter, giving greater operating speed.

The same positioning method may be used for a double-row gang die. An extra punch and die opening are applied to the die, and the strip is run through only once. Gang dies are high-speed tools and should be used where the added expense of the extra punch and die hole are warranted.

Fig. 4 illustrates two triple-row gang dies of the progressive type. At *A* is the layout for a die used to produce washers at high speed; while at *B* is shown a die to produce an elliptical part. Such dies are not limited to three rows; the number is limited only by press size and production requirements.

Blank Area Calculations

In material layout, four cardboard or celluloid templets are cut

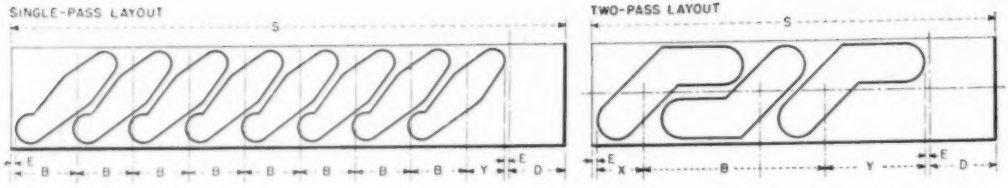


Fig. 6... Formulas are given to determine the number of blanks in a strip and the extent of the waste end *D*

ORDERLY MATERIALS LAYOUT *continued*

out to conform to the contour of the blank required. These templets are laid side by side in the various positions described. The blank area for each method is found, and the one most economical of material is chosen for the die. Sometimes, the best method cannot be used because of bends. In that case, the next best arrangement is used to cope with the required condition of "bends across the grain."

At *A* in Fig. 5 is shown a blank laid out for "Single-Row, One-Pass" positioning. The blank area (the area of the strip which is used for one part) is found by the following formula:

$$\text{Blank Area} = A \times B$$

Single-row blanks which must pass through the die twice have their blank area determined by the formula:

$$\text{Blank Area} = \frac{A \times B}{2}$$

This formula applies to the blank layout illustrated at *B*, Fig. 5, and also to double-row blanks at *C*.

Number of Blanks per Strip

Fig. 6 shows a row of blanks arranged at *A* in the strip for blanking. It is necessary to determine the number of blanks in each strip so as to find out the extent of the waste end *D*. This influences the blank layout, because too great a waste end is uneconomical. The number of blanks per strip is found by means of the formula:

$$A = \frac{S - [X + Y + 2E]}{B} + 1$$

where

A = number of blanks in each strip.

For the waste end:

$$D = S - [B\ (A\text{-}1) + X + Y + 2E]$$

When strips must make two passes through the die as at *B*, Fig. 6, the following formulas determine the number of blanks in the strip and the extent of the waste end:

For number of blanks:

$$A = \frac{S - [X + Y + 2E]}{0.5B} + 1$$

For the waste end:

$$D = S - [0.5\,B\ (A\text{-}1) + X + Y + 2E]$$

Application of the principles and formulas outlined are brought out in making an economical material layout for the piece-part at *A* in Fig. 7. Cardboard templets are laid out side by side in the "vertical position, single-row, one-pass" method. This is shown at *A*, Fig. 8, and it is found that the part occupies a strip area of 3.375 in.

The part is next tried for horizontal positioning, as at *B*, Fig. 8.

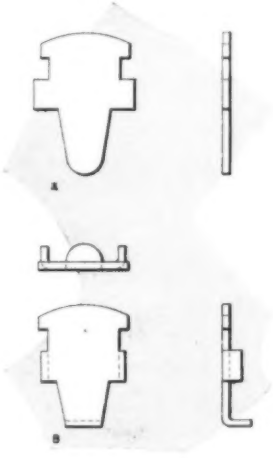


Fig. 7... Application of the principles for blank positioning and economical material is demonstrated for two parts: *A*—a flat piece part, and *B*—a formed piece part with the ears bent after blanking

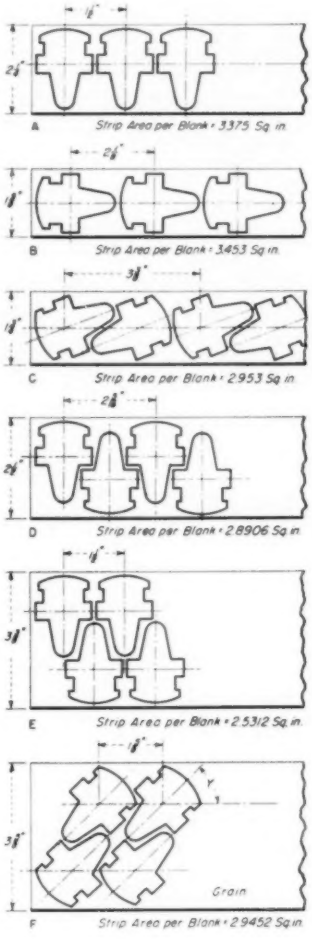

A
Strip Area per Blank = 3375 Sq. in.
B
Strip Area per Blank = 3453 Sq. in.
C
Strip Area per Blank = 2953 Sq. in.
D
Strip Area per Blank = 2.8906 Sq. in.
E
Strip Area per Blank = 2.5312 Sq. in.
Grain
F
Strip Area per Blank = 2.9452 Sq. in.

Fig. 8... Most economical material layout for the flat piece part of Fig. 7 is the double-row, vertical-positioning method, as shown at *E*. When ears must be bent on the part, angular positioning as at *G* is required to

This arrangement gives a strip area for one blank of 3.453 in. Angular positioning is tried as at *C*, and it is found that the area is reduced to 2.953 in. Next, "double-pass, vertical-positioning" is tried, as at *D*, giving further material economy, since the blank area is now 2.8906 in. Finally, a layout is made for "double-row, vertical-positioning", as at *E*, resulting in a strip area for one blank of 2.5312 in. This very economical layout is the one used.

The blank shown in Fig. 7 at *B* has the same contour, but ears must be bent at right angles to each other in a succeeding operation. In this case, the most economical layout cannot be used, as two of the ears would be bent with the grain, a condition promoting fractures. The parts then have to be positioned angularly, as shown in Fig. 8 at *F*. This gives 2.9453 in. area per blank, and is the best that can be realized.

The angle Y is 43° in this layout. For some part shapes, a smaller angle will aid in material conservation, but where bends must be applied to the blank, it should never be made less than 20°.

From these examples, it can be seen that the time spent on an orderly and methodical approach to material layout problems will be more than repaid in later savings on the press line. Every possible combination should be tried, and the blank area calculated in each case, as well as the number of blanks per strip, the extent of the waste end of the strip, and the extent of the waste end of the sheet when shearing the strips from it.

Water-Soluble Oil Proves Good Screw-Machine Lubricant

BY RALPH HAUSE
President, House Valve Company

THE QUESTION that interests industry is: "How is a new product making out in service?"

Recently, an engineer in a large automotive plant wrote us for our experience with soluble oil as a screw-machine lubricant.

Before giving you the gist of what I replied, let me explain that I, too, believed for years that water mixtures of soluble cutting oils should not be used on automatic screw machines. But an oil-company representative brough in a new soluble-oil base, miscible with oil or water.

But let me quote from my letter to the automotive engineer:

"This will acknowledge your inquiry with respect to our use of Houghton's Antisep All-Purpose Base in our automatic screw machines.

"We put this product in one Model 61 New Britain-Gridley on a test basis. In the beginning we used it on the coolant system only; we continued to use lubricating oil in the lubricating system. As you probably know, the lubricating system on these machines includes two filters: one through which all lubricating oil passes, and the other which refilters the oil going to the spindle end of the machine.

"After a day or so, the lubricating oil appeared to be light brown and heavy. A few days later, we could not tell the lubricating oil from the soluble oil. However, we found no lack of or faulty lubrication.

"About that time, another oil-company representative brought in a film-strength testing machine and tested all of our oils, including our regular lubricating oil, a regular soluble oil, an all-purpose sulphurized cutting oil, a light-weight high-speed spindle oil and, of course, the Antisep Base in various mixtures. We were astonished to find that we did not have an oil in the shop that showed as much film strength on this machine as did the new soluble base in a 15:1 solution.

"At this point, we discontinued the use of a lubricating oil in our automatics. And, as our supply of sulphurized cutting oil became exhausted, we cleaned our machines and put the Antisep Base in the lubricating systems as well as in the coolant systems.

"We use a 15:1 solution all the way through and our tool life and finish compare favorably with what we were getting at the same speeds and feeds when using a $.40 per gal. sulphurized cutting oil. We do not centrifuge our chips, as the carry-away is much less than with cutting oil.

"Extra maintenance can be attributed to this oil, but it has not been of a serious nature nor due to lack of lubricating qualities. Our machines are about five years old. Our first difficulty was with the pumps. We corrected this by installing new shaft seals and other pump parts to bring their performance equivalent to new. We found that the worn pumps would handle cutting oil but not the water solution.

"Then we had some clutch trouble. The multiple disks stuck and would not disengage as quickly as with regular oil. This was caused by a gummy condition, which we controlled by applying a small amount of solvent to the disks with a hand oil can.

"Some rearranging of oil lines and control of oil flow in the lubricating system has been necessary. One should carefully examine and regulate the oil flow from each line. Additional lines to points not actively lubricated are necessary in some instances and reduced flow to other points. In short, we made sure that every moving part in the gearbox receives some splash or direct flow lubrication. Ball bearings require very little—a splash once in awhile is enough but if they are not kept wet, they will rust.

"We also experienced sludge formation when the solution was first put into the machines. This disappeared after several months, by which time the mild solvent action of the solution removed film built up over a period of years from the cutting oils previously used.

"About the highest spindle speed we use is 2400 rpm, and we have noticed no abnormal heating in the bearings. On the other hand, we find that the coolant and work stay much cooler than when using cutting oil, especially on jobs where lots of metal is being removed. We do not degrease our work and there seems to be no corrosive effect from the solution.

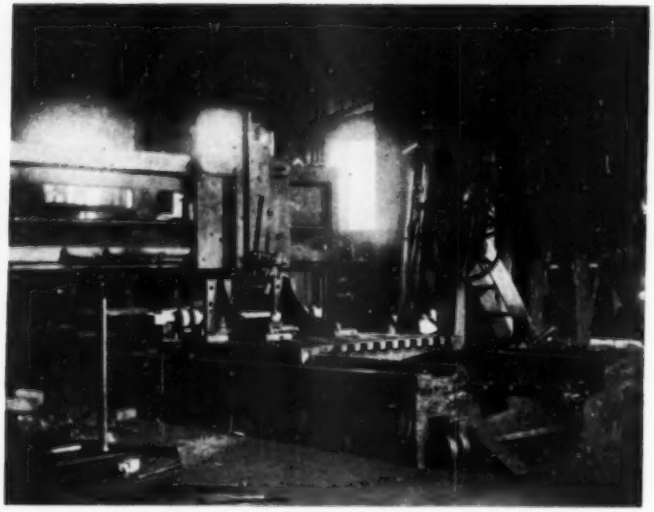
"Even though we have had some extra maintenance work as described, our saving in oil cost has been remarkable. Since there has been no sacrifice in quality or tool life, we plan to go ahead with this type of coolant."

Since writing the foregoing letter, we have found it possible to increase the water content of the coolant. We use 15:1 for new solutions and 30:1 mixtures for necessary additions.

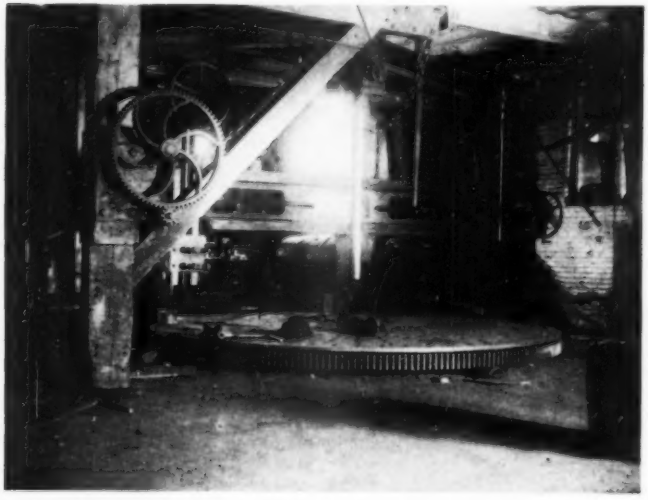
Relics That Made History

BY FRED H. COLVIN
EDITOR EMERITUS

Those "good old days" the old-timers talk about really weren't as good as they like to make you think. If you want proof, just drift back into the years when the machine-tool industry was stirring into its first growing pains—



THE ONLY PLANER around in 1838 was a Silver & Gay machine in N. Chelmsford, Mass. Cast-iron ways were bolted to a granite bed, and had to be hand-chipped to bearing surfaces. The table was driven by a flat link chain between the ways. This shot was taken on a glass plate in 1895, before flash equipment was developed

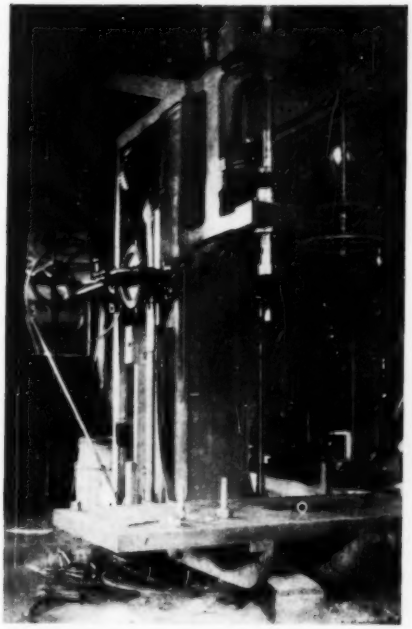


THE SAME SHOP had a 16-ft boring mill with both a boring bar and a side head for machining steam-engine flywheels. Rollers in the floor under the table's edge helped the main bearing support the weight. The jib crane, despite its clumsy appearance, saved a lot of manpower and backaches

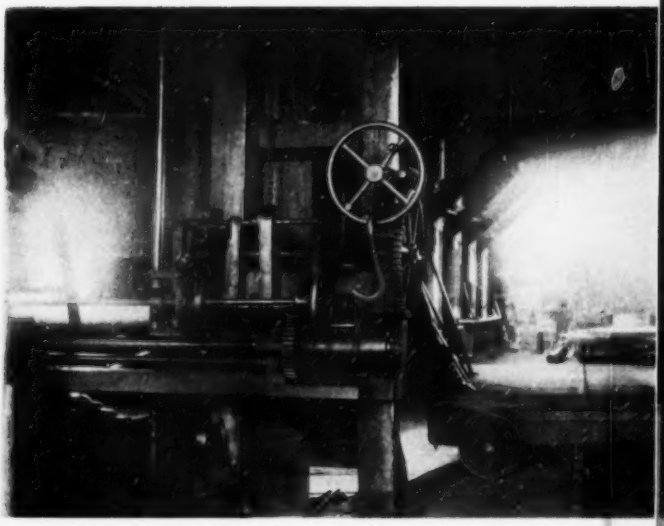
How good is your memory—or don't you need a memory to visualize machines like these antiques?

While these machines were crude in design, they show great ingenuity and were the beginning of the industry on which all manufacturing depends. In the old days it was not a case of improving machines already in existence, as we most frequently do now, so much as it was a case of devising new machines to perform work formerly done by hand tools. We owe the old-timers a lot of credit for what they accomplished under circumstances that would be considered almost impossible today.

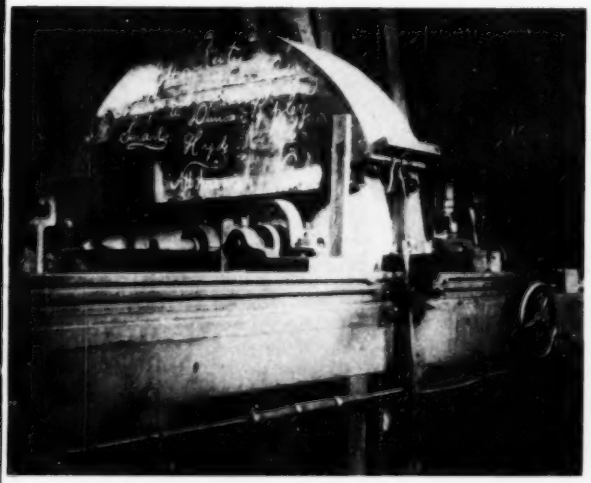
But while we have great respect for the machine-tool pioneers, we can hardly praise the veneration apparently shown by some who keep the old machines in their shops long after they should have been replaced by new models that do a much better job. Yet surveys show that many of these relics are still in use. If machine output is to keep pace with wage increases, modern machines become a must in any production shop. We must replace the machines that belong to the era when the "going rate" for an all-around mechanic was 25 cents an hour. Is your shop a museum?



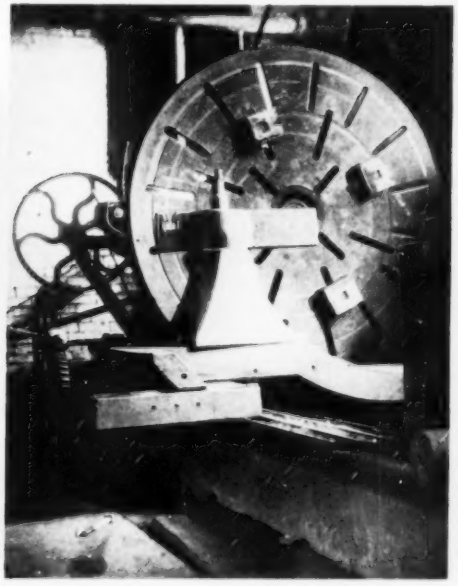
ANOTHER Silver & Gay product was a large vertical drilling machine. It had a hollow box column and a big rectangular table that was raised to meet the drill. The S & G shop is credited by some with "borning" the first milling machine when Frederick Howe, later of Brown & Sharpe, was an apprentice there



AROUND 1850 S & G produced a horizontal boring machine that was set up right next to railroad tracks. Castings were brought up on flat cars to be bored. Vertical travel of the spindle was controlled through a large handwheel and reduction gears and was driven by gears to the extended quill. The crane hook hanging on the handwheel shows modern (1850) design



THE FORERUNNER of modern grinding was a shaft-grinding machine. Some slight control was held over shaft size by roller guides and a bar-stock positioning bar at the grindstone. The carriage was operated by the handwheel and lever. When this picture was new, horsepower really meant manpower



AN OLD LATHE exemplifies early machine-tool design with its "corn-cob" toolpost and light carriage that was built like a yoke to clear large work. Despite the large faceplate and clearance, light cuts were the order of the day

ROUND TABLE

Cost Shark

"If I've got a sour look on my face, don't blame me," complained Ed. "Did you see the latest memo coming from the office?"

"About putting the estimated cost on each job as it goes into the shop?" replied Al.

"Now isn't that a hell of a thing to tag on to a foreman? As though I haven't enough things to attend to without having to rack my brains with detailed estimates!"

"Don't you think it is part of a foreman's job to figure the cost of things that go through his department?"

"In a way, yes, Al, but to have to put a figure on a job to let the man know what is expected of him—well, I don't like the idea of it. I'd rather depend on my men to do their best on a job without holding them to meet a deadline."

"That's the way things are going these days, Ed," smiled Al. "Modern business, you know, calls for something definite in the way of knowing what things will cost before they are accomplished."

"They won't cost any less for all the trouble one is put to to figure them out. Besides, Al, there are unforeseen things that always come up to put the estimator on the spot."

"For instance?"

"Such as annoying delays and—well, you know how it is, Al, mistakes in judgment and many other things that crop up that you can't see beforehand."

"All the more reason why things should be figured out before time—one could provide contingencies to cover such," replied Al. "It was always my practice at the Cockeyed Optical Machine Company to allow 30% for contingencies."

"Even though you do cover the uncertain element, there's always the feeling among the men that they are being coerced into unusual pressure—this tends to reduce the quality of the work."

"Why should a man object to having a figure placed on the job that was given to him? It can't be expected that the work will be done exactly as estimated—you know it takes a good man to estimate on the line most of the time."

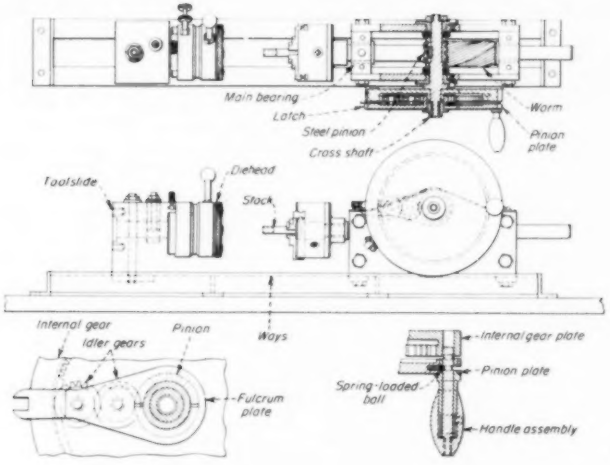
"Well, tell me, Al; this idea strikes you as being good. What, exactly, is to be gained by this estimating?"

"It gives the office an inkling of what to expect in the way of costs. For the life of me, Ed, I can't see why you should be against such a plan—surely you're not so old-fashioned that you can't see eye to eye with modern methods!"

"Give me the good, old-fashioned faith in my men to do their best for me without having to hold a club over their heads!"

***ARE ESTIMATES** likely to be considered "clubs" by the men on the job? Is it fair to ask a foreman to estimate work? Is it a burden to him—or a help in managing his operation? Your opinions and ideas will be appreciated by others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Bench Threading and Tapping Machine Alters and Finishes Standard Screws

BECAUSE we had trouble with badly formed screws—the last few turns on each were left shallow by a threading operation that was off pitch—we devised a bench machine that works by hand power. Many features of the machine can be applied in other shops.

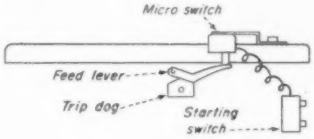
The machine is built on ways made from angle iron, machined on top and on the edges. Angle-iron braces support the ways from underneath. The geared headstock is fixed to the ways by means of heavy bolts, but the toolslide is fitted with gib clamps, which allow it to be moved up and down the ways. Standard toolheads are clamped in the bore of the toolslide, and, for tapping operations, the chuck can be moved to the toolslide and be replaced by a tapholder.

In the headstock, two bronze-bushed main bearings are held by side plates, and these house a shaft that acts as a main spindle. The shaft carries a large worm with eleven teeth at a helix angle of 45°, which is keyed to it. The bronze worm meshes with a short steel pinion at right angles. The pinion is keyed to a cross shaft that is housed in the headstock by two flanged bushings and two thrust ball bearings.

Drive from the handwheel in front of the headstock to the main spindle is through a 20-tooth pinion that is formed with a cover plate for the gear assembly. This drives two idler gears, which turn an 80-tooth internal gear that is keyed to the cross shaft. Either direct drive or a 4-to-1 ratio is possible through adjustments of the driving handle and a latch on the headstock. When direct drive from the handle is desired, the handle is pushed forward into a hole in the internal gear. Two grooves around the shank of the handle are formed so one of them can be held by a spring-loaded ball in the handle assembly in the pinion plate. When the handle shank engages the internal-gear plate, it is held in position by the ball, and it rotates the cross shaft directly.

If a 4-to-1 ratio is desired, the handle is retracted until the ball engages the groove near the end of the handle shank, and a latch on the headstock is engaged with a slot in the fulcrum plate that supports the idler gears. The handle then directly turns only the pinion, which drives the idlers and the internal gear.

A hole drilled down into the main bearing block admits a locking pin which is employed when chucks are changed. In operation, the headstock acts like this: As the handle is turned to rotate the spindle, the worm is rotated, and also advances the work toward the toolhead until it meets resistance. At this point all the motion is turned to rotating the work in the chuck. When the action is reversed after the screw has been worked, the headstock action backs off the work and moves it toward the right when it comes out of the toolhead. *R. B. Wolverhampton, Staffordshire, England.*



Switch Cuts off Machine Motor

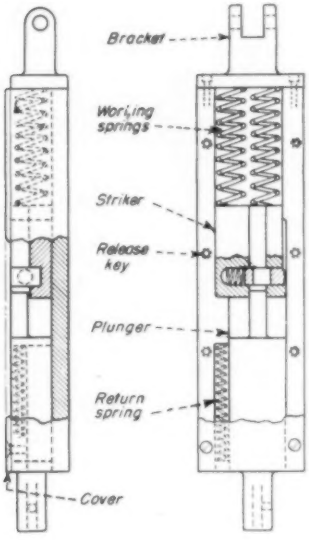
HERE IS a simple idea for shutting off a milling machine or grinder automatically at the end of a cut or pass. Ordinarily, table stops are arranged to stop the feed of a machine at a predetermined location, but the motor is left running. By connecting a Micro-Switch to the starting button and locating the switch at the feed lever, the motor can be shut off when the feed lever is pushed out.

The switch can be mounted on a bracket which, in turn, is mounted on the table close behind the feed lever. When the feed lever hits the trip dog it will be pushed back so it depresses the switch, which stops the motor. *Bernard Levowich, Brookline, Mass.*

Automatic Stamping Machine Marks Soft Metals

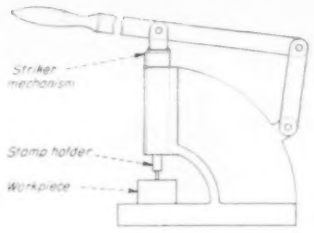
SMALL machine parts made from soft metals that have to be stamped can be turned out rapidly with a simple mechanism that can be made in almost any shop. The machine's frame, link, and handle can be cast and finished off with light machining operations.

The machine delivers a spring-powered blow to the work, which is held on the lower platen of the machine. Downward pressure on the handle brings the stamp in contact with the work. More pressure on the work forces the plunger back up into the mechanism.



The plunger acts against a spring-loaded key, which moves up against a bevel in the wall of the striker. As soon as the hole in the key comes in line with the ends of the striker, the striker is released and, powered by two heavy springs, it delivers a heavy blow to the plunger. When the handle is released a return spring forces the plunger back down, which releases the key and returns it to its original position.

If the heavy working springs are made of 0.077-in. music wire with

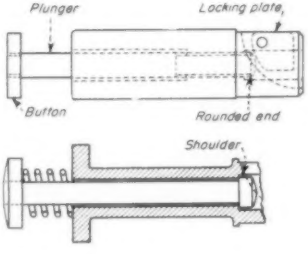


six coils to the inch and with a safe working compressibility of 1 in., a force of about 44 lb will be necessary to compress the springs a length of 1 in., from which they can deliver the blow. About 75 lb will then be delivered to the plunger. Linkage in the handle can be set at a 2-to-1 ratio so only about 22 lb must be delivered manually. All parts should be made with smooth running fits to reduce friction, and the release key and parts close to it must be hardened and drawn. The return spring should have a slightly longer length of compressibility than the two heavy working springs. *D. E. Sweet, Marblehead, Mass.*

Internal Tweezers Simplify Handling

ORIGINALLY MADE for holding sleeves during a flame-hardening process and for effecting quick release so parts could be dropped in a quenching fluid, the illustrated internal tweezers can be put to many uses.

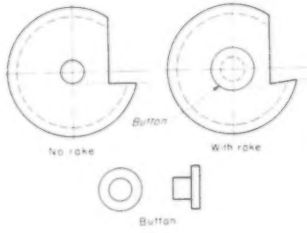
The ends of both styles of tweezers are turned to a slip fit in the part that must be held. The milled slot in the end carries a locking plate supported by a single hinge pin. In both cases a plunger operated by a button at the other end of the device forces against the locking plate to turn it out of the slot. In one case the button is knurled so the plunger can be threaded down in a tapped hole. In the other style the plunger is a slip fit in the tweezer body and is loaded by a spring. The ends of the plungers are rounded off and the profiles of the locking plates are smoothed.



Plungers and sleeves can be made from bar stock while locking plates and buttons can be made from flat stock. The end of the plunger on the spring-loaded style is shouldered so the spring cannot force the plunger out of the body. *H. G. Frommer, Milwaukee, Wis.*

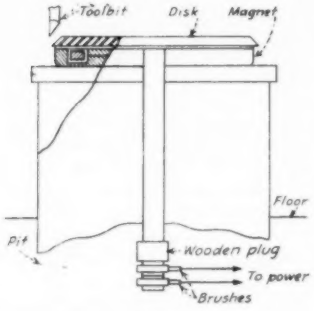
Disk Gages Check Top Rake On Circular Form Tools

CIRCULAR TOOLS as commonly used without tap rake are sharpened so that a straight line along the cutting edge is tangent to the hole as shown at left. With some steels, however, top rake is desirable.



When tools cannot be ground on a tool grinder, a small button which can be inserted in the bore of the tool will serve to gage the correct rake angle. Such buttons are turned with flanges of the correct diameter so a straight edge tangent to the button will line up with the ground cutting edge.

Most commonly, the rake angle should be 10°. For a No. 2 B&S circular form tool, the flange of the button should have a 1.006-in. diameter; a No. 0 cutter will use a 0.695-in. button; and a No. 00 cutter will use a 0.547-in. button. *Otto V. Howe, Waterbury, Conn.*



Electromagnetic Table Holds Plates on Boring Mill

A NUMBER of 4-ft-dia plates were required to have chamfers on their OD's. The plates were $\frac{3}{8}$ in. thick and the chamfers were to be at 50°.

A number of methods were tried out, but finally we found that the only workable one was to rig up an electromagnet on an old boring mill. Two tools were used to finish the chamfers.

The magnet itself was powered off the bottom of the spindle that went down through the table. A wooden plug insulated the table spindle and also supported the power spindle inside the table spindle. Copper rings on the bottom of the power spindle picked up the power for the magnets. *F. G. Forquer, Buffalo, N. Y.*

Spring Feeds Oil to Lever

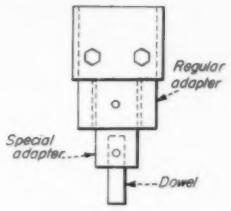
VISIBLE-SUPPLY oil cups can be adjusted to give a regular flow of oil drops to stationary or slow-moving parts, but supplying oil to a reciprocating part or one that moves rapidly is not nearly as certain. Reciprocating members can be fed from a standard cup through a spring, attached to the oil cup.

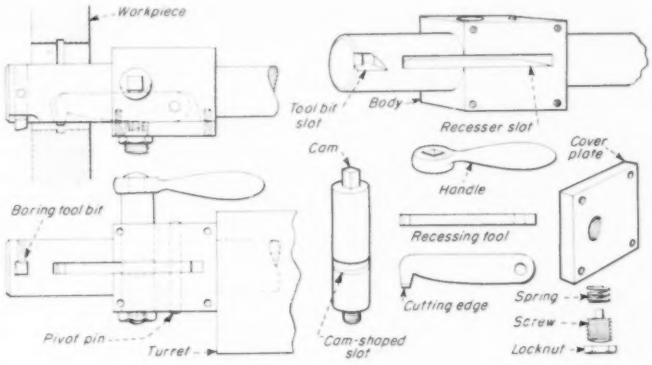
The tension spring should be attached to the outlet of the cup and to the point on the member where oil is required—or slightly above that point. The spring should be chosen so it is fairly taut, so excess vibration will not throw the oil off before it gets to the member. Allow for the member's throw. *Ray Cafiero, Brooklyn, N.Y.*

Second Adapter Speeds Standard Punch Setup

FOR A quick and practical punch setup, instead of turning down a punch to fit an adapter and at the other end to fit the hole in the die, then heat treating; simply take a standard size hardened dowel pin to fit the die and make a second adapter to fit it and the regular adapter.

A flat can be ground on the pin, and the adapter can be drilled, then drilled through the side and tapped for a setscrew. This only takes five minutes, and it is a lot easier than the process for making a new punch each time you have to change size. *Alfred Rheingold, Brooklyn, N. Y.*





Combined Turret Tool Does Both Straight Boring and Recessing

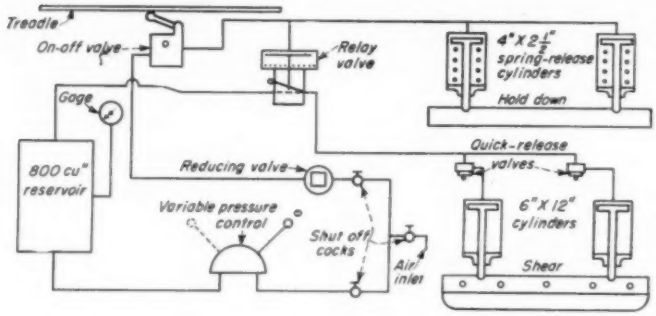
THIS combination boring and recessing tool was designed several years ago to replace two tools in a turret lathe. Formerly a boring bar was used in one face of the turret and a second face held a special recessing tool.

The tool body was turned from a piece of square-section steel; one end formed like a conventional boring bar, the other end turned to fit the hole in the turret. The slot for the recessing tool was milled out. A recessing tool was cut from tool steel, hardened, and ground to fit closely in the groove. The cutting edge and the face where the cam rubs were tipped with Stellite.

The recessing tool worked around a pivot pen. Cam action forced the edge of the tool into the work against the pressure of a spring that was bolted into a hole in the body. A conventional boring toolbit was mounted at the end of the body.

Normal turret feed ran the boring tool through the hole until the feed was tripped by a stop. This stop was located so the recessing tool would be in the correct position to cut the groove. The turret was held against the stop with one hand, while the operator's other hand twisted the cam that forced the grooving tool into the work.

Several hundred thousand pieces were bored this way, with only occasional renewals of the welded cutting tip. Chatter was eliminated by close fit of the recessing tool in this slot. *B. A. Lee, Lockport, N.Y.*



Two Pneumatic Systems Control Shear Blade and Hold-Downs

BOTH these air-power systems have been tried out and used with success. The first one was made for variable control of the shearing force because a number of different thicknesses of stock had to be cut. The second system was for a shear that only took one thickness of stock, although this was quite thick, so only a constant shearing force was required.

For variable-force control system, a simple roller cam operated an on-off valve under the treadle that ran the full length of the machine. When depressed, the valve actuated two cylinders that dropped the hold-downs on the stock to clamp it in position immediately. Air pressure in the line was 100 psi, but 60 psi was required to start the relay valve that directed air to the shear, so the hold-downs were firmly in place before the shear action started.

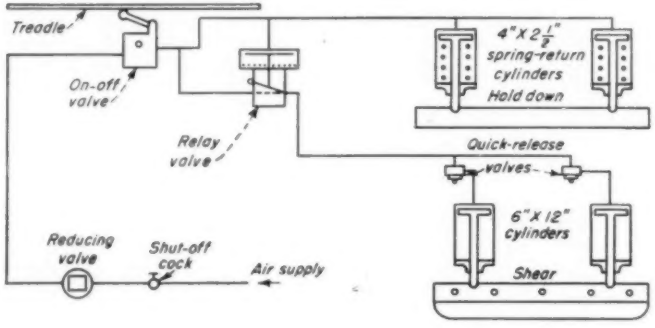
When the relay valve opened, a 800-cu in. reservoir was opened to the cylinders attached to the shear blade so plenty of power was available for cutting. Quick-return valves at these cylinders insured that the blade would raise before the hold-downs lifted.

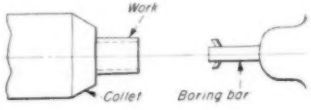
As the treadle was released by the operator, air was vented to the hold-down cylinders and to the relay valve. When the pressure dropped to 60 psi, the relay valve closed and the shear cylinders immediately exhausted through the quick-release valves. Finally the hold-down cylinders released.

The variable-pressure control was graduated in ½-in. marks from 0 to 100 psi, and had to be set according to the thickness of stock. After running sample stock through the shear, the graduation marks were numbered in actual thickness measurements so the operator could instantly select the right pressure for a given stock size. The reservoir tank provided plenty of volume for continuous operation of the shear and provided snappy action in the hold-down and shear-blade cylinders.

Constant pressure was desired for the second system, so a pressure controller was left out, as was the reservoir tank. Rough settings for pressure could be made with the reducing valve, but accuracy was not high. Here, too, the hold-downs were actuated before the blade was started, so miscuts were rare. This particular system was run off a line that had 80-psi pressure.

Application of pneumatic controls allowed shearing with one operator instead of two. The flexibility of pneumatic operation allows many other air-cylinder locations that can speed up production and cut costs. *Ed Holbrook, Washington, D. C.*



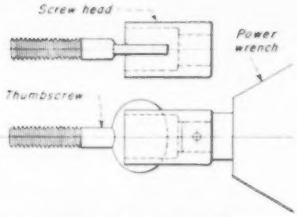


Combined Boring-Bar Tools Rough and Finish in One Pass

BETTER BORE finishes and faster production are two advantages of this idea: mount two toolbits on a boring bar, one on each side. The finishing tool is slightly behind the other.

One bit does the roughing; the other only finishes, and must be set so it takes a light cut. For this kind of setup, the bar must be quite large in relation to the bore, so the bits will be only slightly exposed. The bar must also be sturdy to eliminate as much spring as possible, because if the bar bends, the roughing tool will be backed off and the finishing tool will be dug into the work.

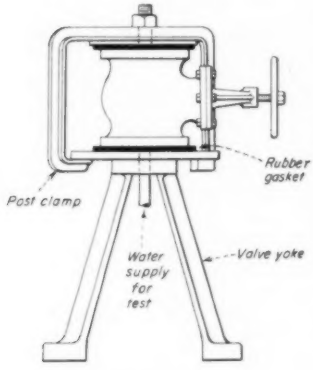
Preferably, the roughing tool should be 1/16 in. ahead of the other tool, which should only cut off about 2 or 3 thousandths. *Charles A. Lauer, Ft. Wayne, Ind.*



Air-Wrench Tool Speeds Fixture Assembly

THUMBSCREW assembly to complicated fixtures and manufactured products can be greatly speeded with a small tool that fits an air wrench.

An ordinary socket-head screw is slotted through its head to slip over a thumbscrew head and is then attached to the wrench. *Roger Isetts, Kenosha, Wis.*

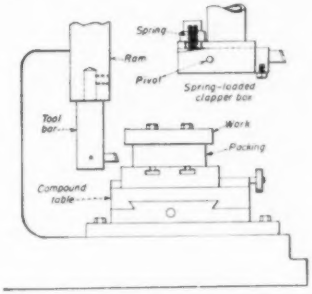


Large Yoke Substitutes for Valve Test Stand

WHEN NEW test stands for pressure-testing valves were impossible to obtain, a large-size yoke from a discarded valve was set up to support the valves.

The yoke was fixed to the floor, and a drilled plate mounted on top. Valves were clamped on the plate by post clamps, with rubber gaskets between the lower and upper plates and the valves. The water supply was attached to the valve through a pipe down through the center of the yoke.

This made testing as easy as with the regular stand, and had the advantage of enabling operators to do touch-up grinding on the valve casting right on the stand. A large yoke brought the lower plate to about 28 in. from the floor —which is a normal bench height for large parts. *Chapman Valve Mfg. Co., Indian Orchard, Mass.*



Vertical Ram Press Profiles Simple Flat Workpieces

SIMPLE PROFILING on workpieces of medium thickness can be done on a vertical eccentric ram press with a compound table fixed to the press table.

The work should be laid out, then bolted to the table with a packing plate of similar outline, but smaller all around, providing clearance under the edges of the work. A toolbar for a single-point tool can be made to fit into the shank hole in the press ram. The press can be set at about the right number of strokes per minute so the table can be adjusted or moved in any direction while the ram is working.

If only a few pieces are to be made, the tool can rub on the return stroke, but if quite a few parts are required, a spring-loaded clapper box should be made to shift the tool after each stroke. This can be a simple block that holds the tool at one end and is backed by a compression spring at the other. The toolholder should be pivoted so that on the return stroke the spring's pressure will push the toolbit down, and also slightly away from the work.

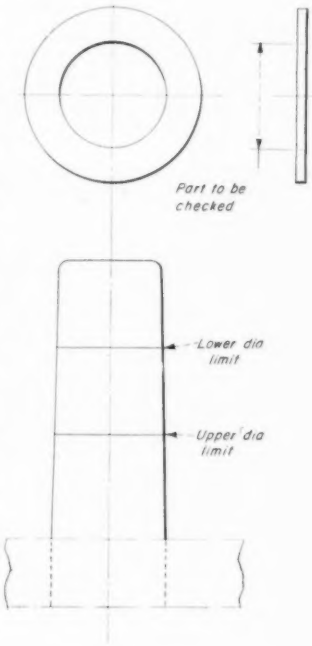
If shapes are simple, punch or die work can be profiled with relief by setting the work on a tapered packing plate. The shape of the tool may have to be altered during the job to cut the right profile, but the speed of setup should offset this difficulty. *Dan J. Penway, Cumberland, England.*

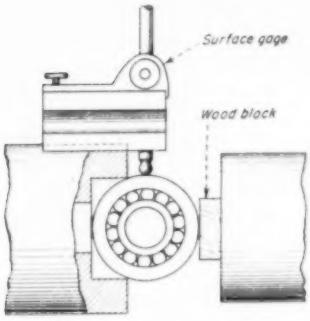
Tapered Mandrel Quick-Checks Washers and Similar Parts

HERE'S a fast way of checking thin parts that must be accurate on their internal diameters. The tapered mandrel can be mounted on a block of wood or metal base.

Two scribed circles around the mandrel—they don't even have to be all the way around—indicate whether the parts are within dimensions, oversize, or under by their positions relative to the parts, which are dropped over the mandrel.

Tapers for this gage style can be either great or small, depending upon the accuracy required. A sharp taper will speed inspection by holding the high and low points close together. *Frederich Jerome, Cincinnati, Ohio.*





Bearing Housing Finished by Setting Tool to Surface Gage

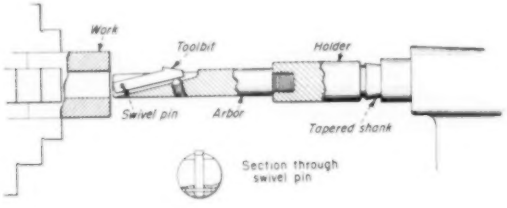
BALL BEARINGS must be housed with an exact fit, so great care must be taken while boring the housing to the finished size. I find it a convenience to be able to set the boring tool to the exact dimension of the bearing race for the final cut without measuring.

After the hole in the housing has been roughed out, I place the bearing endwise into the hole, move up the tailstock, and hold a piece of wood against the bearing so the bearing can't move. Then I set a surface gage on top of the work and adjust the spindle to the highest point on the bearing.

Now the tailstock is backed off, the bearing removed, and the boring tool is brought up to the work. The tool can then be set to touch the gage spindle, which will align it exactly for the final cut.

This method avoids all measuring and setting of the graduated collar on the lathe, which is usually not too accurate, and makes the final setting from the bearing. *H. Moore, Hamilton, Ontario.*

LAYOUT BLUE can't easily be removed from the hands with soap and water, paste soap, or gasoline, but two common chemicals do a good job. Acetone is the cheaper, and amyl acetate is the faster cleaner. A rag can be dampened with either liquid and the blue can be sponged away. These fluids will also work well to clean up excess bluing on die parts. *Basil Clark, Evansville, Ind.*



Lathe Cutter Machines Keyways

KEYWAYS in little parts like collars, gears, couplings and such are often troublesome because a shaper setup for cutting the keyway is too large for accuracy, and a push-rod setup isn't worth the bother it causes. For such jobs we use a lathe setup.

The cutter is mounted on a holder that has a tapered shank that fits in the tailstock. A swivel pin holds the cutter to the arbor, and a small setscrew under the back end of the cutter allows adjustment vertically. The shape of the slot in the arbor is such that it can be milled out easily with a plain milling cutter for each job. The arbor should slide-fit in the bore that is to be keywayed. Drilling the holes for the swivel pin and the setscrew and tapping for the setscrew are easy operations. The arbor screwed into the holder.

After each cut the setscrew is tightened to move the cutter farther into the work until full depth is reached. On small work and on soft-metal parts, the tailstock handwheel can be rotated by hand to run the cutter through. *Lowell F. Stull, Youngstown, O.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER— Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

89th Winner:

J. H. Sperman

Cast-Iron Dies

NEWS OF METALWORKING

Plants Will Buy More Production Equipment in '50, ASTE Survey Shows

DETROIT—A national survey of projected 1950 purchases of new machine tools, accessories, materials handling and other production equipment, just completed by the American Society of Tool Engineers, reveals that, of the companies reporting, 80% state that they plan to buy either more equipment or the same amount as in 1948.

Conducted in connection with plans for the ASTE's Industrial Cost Cutting Exposition in Philadelphia next April, the study was carried on through questionnaires addressed to members of the society—representing a high proportion of industry in the United States.

Large Firms to Buy Most

The larger companies show the biggest increase in planned purchases, 79% stating that their 1950 purchases will exceed those for 1948. Only 7% say they will buy less equipment. Medium sized companies show these totals: More than 1948—55%; about the same—29%; less, or very little—16%. Of the smallest companies, 28% state that they will buy more equipment than in 1948. However an additional 50% estimate their planned 1950 purchases as equal to the 1948 level, while 22% say they will buy less.

Will Buy 45% More Equipment

For all companies the totals show that 45% will buy more than in 1948, 35% will buy about the same amount, 7% will buy "less," 13% will buy "very little."

Of particular interest are the reasons given for these planned capital expenditures, as well as a general breakdown of the type of equipment to be purchased. Following are some of the findings:

Large companies: 86% plan to buy new machine tools to reduce present manufacturing costs; 78% plan to buy various types of machine accessories to modernize their existing equipment—again to reduce cost; 57% plan to increase their materials handling facilities to reduce costs.

Medium sized companies: 75% are planning to buy new types of machines to reduce costs; 66% plan to buy machine accessories to modernize existing equipment; 48% plan on replacing obsolete equipment, and 27% plan to purchase new materials handling equipment.

Smaller companies: Reasons for purchases of new equipment by smaller companies are fairly evenly divided between new equipment to cut costs, replacement of obsolete equipment and modernizing of existing equipment to cut costs, with the last mentioned showing the highest percentage. In this group 22% state they are planning to buy new materials handling equipment.

Cost Cutting Emphasized

All companies: New machines to reduce costs, 64%; modernizing of present equipment, 64%; replacement of equipment, 54%; new materials handling equipment, 27%.

The study revealed an increase in the average time allowed for new equipment to pay for itself. Some 68% of the companies indicate that they will be satisfied if the equipment pays for itself in two years or more. Over half of these actually are figuring on buying equipment even if it takes three years or more to earn its original cost.

A number of companies reported that they are planning the tooling up of complete new plant setups during 1950 to manufacture new products.

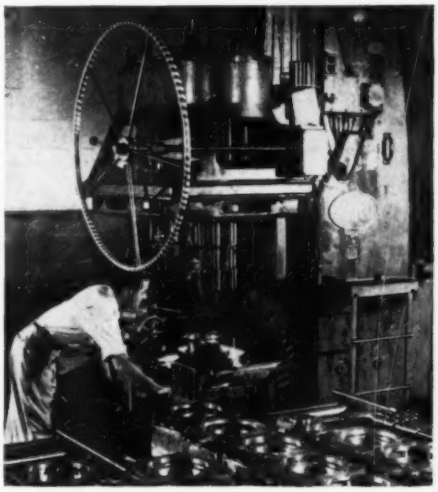
Manganese Supply Still Short; Year's Stock Wanted

WASHINGTON—The U. S. is still short of manganese, although imports of the ore have improved during the latter part of the year. During the third quarter imports rose by 26% over the second quarter and 52% over the third quarter of 1948.

India was the leading foreign source of the ore, followed by South Africa and the Gold Coast. Imports from Russian territory, formerly the largest contributor to the U.S., are negligible now. Indian production and shipments have improved materially.

Manufacturer's stocks of the ore constitute about a four month supply. Industry wants about a year's supply on hand —to feel happy about the situation.

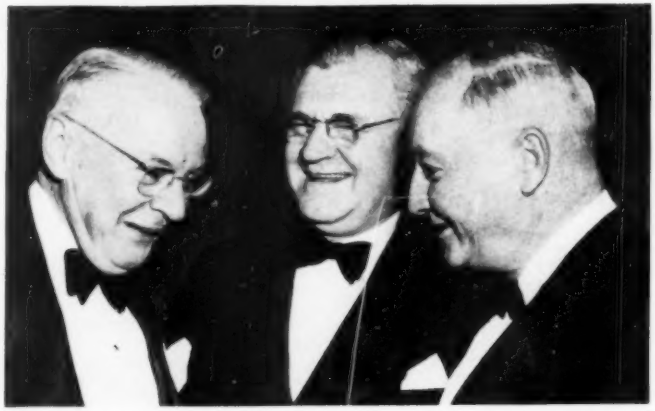
The Munitions Board has placed aluminum pig metal on the 1-A list of materials purchased for the stockpile. This means that starting next July 1 the military stockpilers will, for the first time, start buying the light metal. Bauxite, the aluminum ore, has been on the purchase list for some time.



***ANTI-FRICTION** journal bearing, developed by SKF Industries, Inc., Philadelphia, cuts down vibration in railroad passenger cars. Each assembly consists of a four-row cylindrical roller bearing and a single-row ball thrust bearing. The inner rings on both bearings are clamped on the axle journal which, in turn, is free to move laterally within the outer ring of the rigidly-held roller bearing within the journal box. This SKF plant scene shows stage in production of journal boxes that inclose bearings*

Failure to Replace Tools Hurts Nation, ASME Hears

How to Cut Costs Stressed In Technical Papers Given



1950 ASME President James D. Cunningham, president of Republic Flow Meters Co., Chicago, chats at the 70th annual meeting with Clarence E. Davies, ASME secretary, and James M. Todd, consulting engineer of New Orleans, La., ASME 1949 president

NEW YORK—The tardiness of American industry in replacing obsolete machine tools by new models of greater productivity is slowing down the normal advancement in the American standard of living, Tell Berna, general manager of the National Machine Tool Builders' Assn., told members of the American Society of Mechanical Engineers at the 70th annual meeting of the society held at the Hotel Statler Nov. 27-Dec. 2.

"Never before in the history of our country," Mr. Berna said, "has improvement in machine design been so rapid, and American business been so slow to take advantage of it. According to a survey recently completed by the AMERICAN MACHINIST, 95% of America's metalworking equipment was built to designs that are now over ten years old.

"When an advance in machine design makes possible increased productivity, benefits are realized by the wage-earner, the stockholder, and the user of the end product only if and when the new machine is put to work in the shop. But the purchase of a new machine is a capital investment in the future—and decisions to buy require a social and political climate suitable to risk or venture. Needless to say, that has not been the climate of recent years.

"While tax policies have penalized investment in new capital equipment, social theorists have propounded the amazing theory that a higher standard of living comes from Government rather than machines; seeking to do by politics what can only be done by production.

"Unless this country is to relapse into a frozen economy, with no chance of tomorrow ever showing an improvement over today, this trend must be reversed. Obsolete machines must be replaced; labor unions must learn that more jobs and better wages depend upon greater productivity; and the public must look to technological advances instead of to Government for a more abundant way of life."

NMTBA General Manager Tell Berna, who told the ASME of the need for a sound equipment replacement policy

Cost Control Stressed

Control of costs is a prime function of management if the present high standard of living in the United States is to be maintained and increased, Bruce Wallace, vice president of Otis Elevator Co. declared to the ASME members.

In the fight against higher costs, he urged the improvement of productivity through better tools, designs and methods of manufacture, adding that management should also resist granting to unions concessions which decrease productivity and increase costs.

Participation in Politics Urged

Top management's failure to take a more active part in politics was scored today as "the greatest indictment of American democracy" by Frederick S. Blackall, Jr., president and treasurer of the Taft-Peirce Mfg. Co., Woonsocket, R. I.

Mr. Blackall termed greater political action on the part of management, "good insurance for tomorrow's industrial climate." He said that this was more important than ever today because of the danger of a demagogue, equipped with an audience of millions via the radio, pushing "rash" legislation through Congress.

Gas turbine power plants for locomotives, now being developed, burn low cost fuel, are highly concentrated, involve only rotating apparatus and offer the possibility of low maintenance, The ASME heard. On the

New ASME Officers Named for 1950

The election of James Dalton Cunningham, president of Republic Flow Meters Co., Chicago, as the national president of The ASME for 1950, was announced October 5 at the society's headquarters in New York.

Regional vice presidents elected to serve two-year terms on the council of ASME are: Frank M. Gunby (re-elected), associate and director of Charles T. Main, Inc., Boston; John C. Reed of Bucknell University, Lewisburg, Pa.; Albert C. Pasini, assistant superintendent, Production Dept., Detroit Edison Co.; Samuel H. Graf of Oregon State College, Corvallis.

Elected as directors-at-large to four-year terms on the Council were: Benjamin P. Graves, director of design, Brown & Sharpe Mfg. Co., Providence, R. I.; Thomas E. Purcell, general superintendent, Power Stations, Duquesne Light Co., and general superintendent, Allegheny County Steam Heating Co., both of Pittsburgh.

other hand, they have a relatively high fuel rate, require gear reduction for either the standard electric drive or direct connection to locomotive driving wheels and their output varies considerably with altitude and ambient temperatures.

These pros and cons and the operating details of gas turbine locomotives of 4000 and 4500 horsepower that are being developed and tested by Westinghouse Electric Corp. and General Electric Co. were presented at a technical session by engineers from both companies.

A new machine developed by Douglas Aircraft that analyzes automatically the telemetry records from a V-2 flight, effects savings of more than $9,000 for a single record as compared with the cost of manual analysis, Bernard S. Benson, research engineer with Douglas Aircraft Co., Inc., Santa Monica, Calif., declared at the meeting. The man-hour ratio is more than five to one in favor of the automatic method, he said.

The machine was described as being able to read, count, sift, scan, decode, correct and plot multiple quantitative instrument records taken from line pictures on film.

Materials Handling Talks

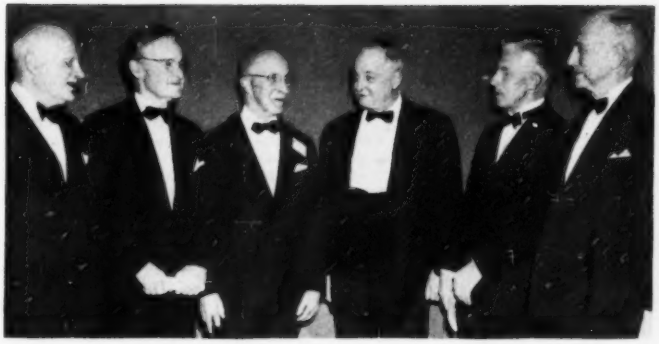
"The Profits of Mechanized Handling" were told by R. C. Sollenberger, executive secretary, Conveyor Equipment Manufacturers Assn., Washington, D.C. In citing a number of examples of large savings through conveying systems, Mr. Sollenberger told of an aircraft engine manufacturer who "reduced travel of parts from more than a mile to 1660 feet and reduced his parts inventory by 91% through a carefully planned production conveyor system. The savings in interest, on cost of materials in process paid off his investment in conveyors in one week."

In one highly mechanized foundry, he said, ten different types of conveyors are employed to enable 26 men to produce 120,000 lb of poured molds a day at a rate of two a minute. "Four men now do the work of ten since they are relieved of almost all manual effort. Floor space is less than a quarter of that required to produce the same number of castings without conveyors," Mr. Sollenberger said.

Conveyor System Draws Interest

Considerable interest was shown in a unique overhead power and free conveyor system for moving cores, castings and scrap at the Bridgeport foundry of Aluminum Corporation of America, described in an illustrated talk by C. H. DeLamater, works manager.

The system is made up of seven independent loops that operate as a complete unit through switching that in many instances is controlled automatically by a limit switch and preset selectors. As a result, the system achieves the remarkable flexibility necessary to an operation that is essentially of the large scale jobbing type.



***HONORARY MEMBERSHIP** in the ASME was conferred on D. Robert Yarnall, president, Yarnall-Waring Co., Philadelphia; Roy C. Muir, vice president and general manager, Apparatus Dept., General Electric Co., Schenectady; Samuel W. Dudley, dean emeritus, School of Engineering, Yale University; and Alex D. Bailey, vice president of Commonwealth Edison Co., Chicago. Here, left to right, are Ely C. Hutchinson, chairman, ASME Board of Honors; Messrs. Yarnall and Muir, James M. Todd, 1949 ASME head; and Messrs. Dudley and Bailey*

A prime consideration in controlling maintenance costs, according to Howard Bishop, chief industrial engineer, Youngstown Sheet & Tube Co., Youngstown, Ohio, is the type and condition of the equipment, "and whether the cost of maintaining it in operation is excessive because it is no longer adequate for the work to be performed."

The quality control indicator, a new device which automatically performs the principal functions of control charts for percent defective, was presented by R. C. Miles, Refrigerator Quality Control Div., General Electric Co., Erie, Pa. The device indicates "quality" continuously by a meter. If the meter needle is in the green portion of the scale, a normal percentage of rejects is present; if the needle moves into the red portion, a new or unusual trouble is indicated and corrective action is called for.

"The percent of rejects is markedly reduced," he said "thereby improving product quality and materially reducing scrap and re-work expenses."

Speaker Compares Performance of Twist Drills Using Various Cutting Face Finishes

In "A Study of Cutting Face Finishes and Treatments on Twist Drill Performance," a paper presented by Charles E. Bierwith, Master Mechanics Div., Buick Motors, ASME members were told of conclusions drawn from tests involving two production drilling operations, one on a cast iron intake manifold with a 7/16 in. diameter hole, the other on a forged steering knuckle with a 27/64 in. diameter.

Drills of two different types of steel—T-1 (tungsten) and M-2 (molybdenum)—were used. Eight different surface finishes were tested—milled, soft groove polish, bright flute, chrome plate, vapor blast, ferrox, gas nitride, and salt nitride.

It was found, Mr. Bierwith reported, that in drilling cast iron, drills made of T-1 steel had a performance 112% better than drills made of M-2 steel. For drilling a steel forging, drills made of M-2 steel had a performance 43% better than drills made of T-1 steel.

In reconditioning the drills used on cast iron, the M-2 steel drills had 15.5% more stock removed than T-1 steel drills, while in reconditioning drills used on steel forging, the M-2 steel drills had 25% more stock removed than the T-1.

Of the finishes, the bright flute was found to be the smoothest, with the soft groove polish finish second and the milled finish third. The gas nitride treatment increased the size of the drills from 0.003 to 0.004 in. on the diameter, thus making them too large to be used, Mr. Bierwith revealed.

ECA's Efforts to Aid Small Business Paying Off; Turkey Wants Equipment

WASHINGTON—ECA's efforts to aid small U.S. businesses get bigger share of Marshall Plan export orders finally are showing signs of paying off. Biggest problem: trying to figure out just how to carry out the law and not break it at the same time. ECA is charged not to interfere with normal trade practices, and at the same time to see to it that small businesses—many not traditional exporters—get more ECA orders.

Actually it has taken ECA planners seven months to work out a program and get it moving. Biggest accomplishment so far is to get some of the European countries to do their ECA buying on a sealed bid basis with plenty of advanced billing on what products they want to buy. Theoretically, this gives the small producer as good a chance as the big producer. It's too early to see if it will work out that way.

Other steps include: a directory of small U. S. businesses—and what they have to sell—who wish to export which will be printed up in various languages and distributed throughout western Europe. Registration for this list is going on now until Dec. 10. Application blanks are available at your local Chamber of Commerce or Department of Commerce field office.

An export counseling service to introduce small businessmen to the basics of ECA operations.

A register of European importers buying under the Marshall Plan. This will be available shortly.

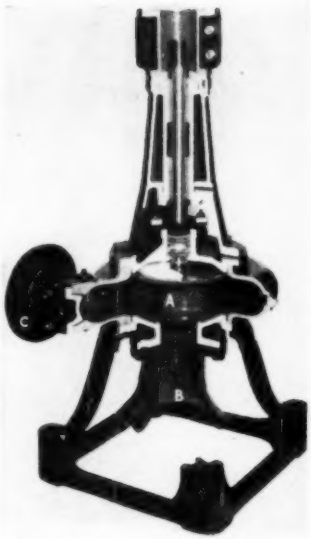
A series of pamphlets on exporting "know-how" designed to brief—and warn—newcomers on the pitfalls and advantages of exporting.

First advance order list to effect machine tool and metalworking producers calls for sealed bids for exporting of a number of items to Turkey. In this case, though, it won't be necessary to go abroad to get the order. Bureau of Public Roads is going to do the buying in this country. Anyone wishing his name placed on the list of bidders should write to:

Chief, Equipment and Procurement Branch, Bureau of Public Roads, General Services Administration Bldg., Room 2111, 18th and F Sts., NW, Washington 25, D. C.

Closing date on bids isn't for two months yet.

Items on the ECA Turkey road project include the following: Milling cutters, drill chucks, grinders, gages, hydraulic jacks, engine cylinder hones, lathes, milling machine, piston turning and grinding machine, cylinder reboring machines, bolt and pipe threading machine, drill presses, cylinder ridge reamers, shaper, band saws, tool kits, a variety of automotive servicing "outfits"—electric, lubricating, welding, car washing, carburetor repair, etc., and a miscellanea of other items.



***BLADELESS** centrifugal trash pump virtually clog-free has been developed by Fairbanks, Morse & Co. Impeller used in the pump has a single channel, without blades. Pumping effect is obtained by so twisting and warping the impeller channel to produce the equivalent of one flow section of a conventional centrifugal impeller. Balance is obtained by using a streamlined counterweight bolted to the outside face of the inboard shroud. In the illustration, "A" indicates the helical pump unit, "B" is the inlet, and "C" the outlet*

Metalworking Employers Must Bargain On Pensions, Other Welfare Benefits

WASHINGTON—Employers in metalworking must be prepared at least to bargain on pensions and health insurance. Under decisions of the National Labor Relations Board upheld in the Supreme Court, employers cannot refuse to bargain on pensions and other welfare benefits.

Further impetus in this direction was provided by the recommendations of the President's steel fact-finding board that the steel workers are entitled to pensions costing 6 cents an hour and health insurance costing 4 cents an hour, all financed by the employer.

Finally, there is the bill going through Congress to liberalize and expand the Social Security benefits. The bill, H.R. 6000, has been passed by the House and will be considered by the Senate finance committee in January.

In most cases, an increase in Federal old-age retirement payments will lessen the obligation of the company. Ford, for instance, guarantees a $100 pension, including Social Security. The Bethlehem formula assures a ""minimum" of $100, also including Social Security.

Two problems getting union attention are (1) how to make pension plans feasible for small employers and (2) how to protect the pension rights of a worker who changes from one employer to another.

As an answer to both, the CIO auto workers in Toledo are trying to get a city-wide plan established by all employers dealing with this union.

The AFL urges its affiliated unions to try to get pension plans set up on an industry or craft basis. As an alternative, it suggests that the unions get a "vesting" provision in their contract which would entitle the worker to take his pension credits with him to another job elsewhere.

The new CIO electrical union says it will insist that a worker be able to take with him any funds contributed by the employer into the worker's pension account.

Functional Photography Film Available to Industrial Groups

NEW YORK—A new 16-mm. sound film entitled "Functional Photography in Industry," surveys the many ways in which photography currently serves industry in research, production, quality control, training, advertising and sales. Among subjects covered are: use of high-speed movies to slow down action of mechanisms, templet making, reproduction of engineering drawings, microfilming of drawings and records to save storage space; use of training films for apprentices and operators, importance of still pictures to guide assembly personnel. Free bookings of the 36-min production may be arranged through the Industrial Photographic Div., Eastman Kodak Co., 342nd St., Rochester 4, N. Y.

Warner & Swasey Campaign Wins Freedoms Award

CLEVELAND—Warner & Swasey Co.'s advertising campaign backing our system of economic freedom was cited as an outstanding contribution to the principles of freedom by a panel of judges made up of State Supreme Court Justices and officials of American patriotic societies. The Freedoms Foundation award was announced at the 1949 Freedoms Awards Program Nov. 21, at Valley Forge, Pa. The advertising campaign was begun over ten years ago.

More Pay Asked By IUE-CIO

WASHINGTON—Tougher wage bargaining can be expected by electrical manufacturers from the new International Union of Electrical, Radio and Machine Workers if the leaders of this new CIO affiliate deliver on their promises.

Devotion to the economic welfare of workers in the electrical machinery and equipment industry without Communist political interference was promised by 400 delegates attending the organization convention of the IUE-CIO at Philadelphia.

Urge Wiping Out of UE

Failure of the United Electrical, Radio and Machine Workers, expelled from the CIO last month, to win its $500 yearly "package" increase demanded from Westinghouse, General Electric and other leaders in the industry was cited by CIO President Philip Murray in criticizing the UE and urging the new organization to wipe out the former CIO union. In turn, the IUE-CIO adopted a three-point, fourth-round bargaining program offered by James B. Carey, chairman of the administrative committee running IUE-CIO, in an economic report on the industry.

It calls for (1) Non-contributory pensions of at least $100 a month; (2) non-contributory social insurance, and (3) wage increases to compensate for "inequities" and improved worker productivity.

Low Wage Protested

It is contended that the average hourly wage of $1.44 paid in the electrical industry last September is 4 cents below the average for all durable goods industries, 26 cents below automobiles, 22 cents below transportation equipment, 20 cents below steel, 18 cents below railroad equipment and 10 cents below aircraft.

It is claimed further that productivity of electrical workers increased 17% between 1939 and 1947.

The new union has issued 133 charters to local unions representing a claimed 221,325 members. The UE insists that it still represents 600,000 workers, including about 75,000 formerly members of the Farm Equipment Workers recently merged with UE.

The struggle for bargaining rights in the industry will continue through most of next year. Petitions for elections have been filed with the National Labor Relations Board by the IUE-CIO and some companies, including Westinghouse and Allis-Chalmers.

MAPI Meets to Discuss Outlook On Capital Goods and Pension Problems

WASHINGTON—Discussion subjects during the two-day reunion meeting of the Machinery and Allied Products Institute in Washington Dec. 2-3 ran through the economic scale.

Included in the program were discussions on the outlook for capital good exports, the outlook for the domestic capital goods market, taxation and risk capital, the business outlook for 1950, and "the pension problem."

The forum on exports consisted of Richard M. Bissell, Jr., assistant administrator for program of ECA; C. W. Jeffers, director of the industry division of ECA; J. Hugh Bolton, president of Whitin Machine Works; Arnold K. Brown, vice-president of Brown & Sharpe Mfg. Co.; and Marshall M. Smith, vice-president of E. W. Bliss Co.

Dr. Edwin G. Nourse, formerly chairman of the President's Council of Economic Advisers, was the speaker at the luncheon session the first day. Roy Reierson, economist of the Bankers Trust Co., New York, was the luncheon speaker at the second session of the Washington meeting.

Burnham Finney, editor of AMERICAN MACHINIST, led off the panel on the outlook for the domestic capital goods market with a discussion of the significance of *AM's* mid-century survey of metalworking equipment. George Terborgh, MAPI research director, W. L. Dean, president of Mathews Conveyor Co.; J. A. Raterman, president of Monarch Machine Tool Co., and Marvin W. Smith, president of Baldwin Locomotive Works, broke the subject down into various economic aspects.

Taxation and risk capital was discussed by W. F. Butler, economist of the McGraw-Hill Publishing Co.; A. D. H. Kaplan, of Brookings Institute, and Howard B. Myers, director of research, Committee for Economic Development.

Pensions were discussed by Ewan Clague, commissioner of labor statistics for the Department of Labor; Murray Latimer, consultant, and Dr. Emerson P. Schmidt, director of economic research, Department of Commerce.

Plant Equipment Ledger Urged As Aid to Sound Replacement Formula

WHITE SULPHUR SPRINGS, W. Va.—Periodic surveys of the condition of plant equipment should be made as regularly as plant inventory is taken, it was declared by L. W. Scott Alter, president, American Tool Works Co. and chairman of the committee on public relations of the National Machine Tool Builders Assn.

Speaking at the NMTBA's 48th annual meeting, Nov. 17-18, he urged assigning to "the plant equipment ledger equal standing with the company's portfolio of securities." To determine the going market value for machinery in a plant, Mr. Alter suggested that this can be done "at regular intervals by simply turning the plant equipment ledger over to a secondhand machinery dealer with the request that he put down what he is willing to pay for the various machines if the owner should decide to sell one or all of them."

"If machines over ten years old are becoming obsolete," he suggested, "why not term them liabilities instead of assets?"

Sales courses will be given again by the machine tool industry in the summer of 1950, James C. Hebert, chairman, sales and service committee and general sales manager, Jones & Lamson Machine Co., reported. There will be three or four courses which sales promotion men, publicity directors and sales executives as well as salesmen, will be urged to attend. He emphasized that the market for machine tools is in replacement of standard machines and in selling high production special machines which cut costs. He urged upon the industry a drive to get users to adopt a well planned, funded replacement program.

If every machine tool builder had his salesman go out and talk about obsolescence and what savings could be made by customers if they replaced old units with new, sales would be favorably affected. Tell Berna, NMTBA general mgr. said.

Detroit

MACHINERY BUSINESS PICKING UP . . . NEW GM TRANSMISSION REPORTED

ANOTHER BIG YEAR EXPECTED . . . 'MIDCENTURY MOTORAMA' PLANNED

Like many other lines, the machinery business in Detroit—and its attitude—is picking up. There may be some slight increase in the number of inquiries coming to tooling producers. More important, there are increasing indications that more than long-term planning for an indefinite future lies behind those inquiries. Any releases which are let out will be enough to give a stimulus of note to the present quiet level of operations.

The one program of consequence in progress at this time is the automatic transmission job for Ford Motor Co. Borg-Warner's Warner Gear Div., at Muncie, Ind., has released substantial orders on this account. Many others have come directly from Ford Motor Co., for equipping its new Cincinnati plant.

Detroit Gear Div. of Borg-Warner is also getting itself in shape for production of its own automatic transmission. This will go to Studebaker Corp., and reports are that deliveries will also be made on this item to Kaiser-Frazer Corp. Studebaker, incidentally, has been making some tooling releases of its own of late.

Mid-Year Start for Ford Plant

Other releases may be expected from Ford for its new pressed steel plant at Buffalo, on which construction contracts were awarded late in November. Plans for this operation call for a start to production by the middle of 1950.

Well-grounded reports continue, meanwhile, that a new transmission is not too far away from final approval at General Motors. The look of this project is not one to create hopes for tooling releases in a matter of months. But certainly within the next year or two—unless all present signs fail—there will be developments in this quarter.

Underlining this picture is the fact that optimism is on an upswing again in the automobile industry—precisely at the time when operations are beginning to recover from the unsettling effects of the steel strike. General Motors, for example, has taken the position that volume in 1950 will approximate that of 1949.

Operations in the plants are on the upswing as the end of the year approaches. Late November saw volume fall down to approximately 75,000 assemblies a week, and some belief was that slightly lower totals might be manifested during the first half of December. That dip, quite definitely, was far less than was expected as late as mid-October. From mid-December on the General Motors plants will be producing once more at post-changeover rates, steadily rising toward average; Chrysler will have recovered from the steel shortage; and other companies as well will be producing better.

And in January the sights are being set high. Practically all companies will be in full scale production on 1950 models—many of them have already been announced—and a concerted effort will be made to stock dealers. The first quarter may be bright indeed.

The tendency toward pension concessions in major industry has effectually eliminated the possibility of price concessions of note on 1950 models. This was signaled when new model cars announced in recent weeks continued with unchanged price tags from 1949 predecessors.

There was, however, a noteworthy jiggle in the price of automatic transmissions. Cadillac, Olds, and Pontiac started it off by cutting their quotations approximately $25 apiece. This brought the Pontiac-Olds price levels to approximately $160 for this popular option. The reason for the cuts was ascribed simply to the economies of mass production, required for the sustained high level of manufacturing in recent years—definitely higher than was anticipated when costing was first outlined on the Hydra-Matic.

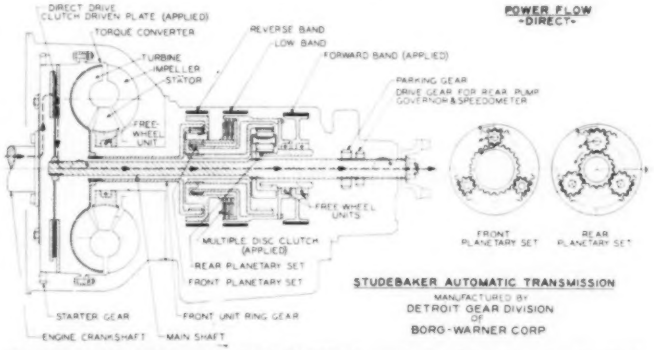
Nash and Lincoln followed suit a few days later with reductions of about the same size on their Hydra Matic installations. Then Buick trumped the suit when it reduced its Dynaflow quotation by $40, presumably for simple reasons of competition, inasmuch as this item is still a definitely expensive one to produce.

The downward wave brought some sideline anticipations that the Chevrolet and Ford automatic transmissions, due out next spring or summer, may appear at price levels of $135 or so, rather than the $150 previously indicated for them.

Big GM Show Planned

All the General Motors lines for 1950, incidentally, will be publicly displayed together for the first time at the Waldorf-Astoria in New York for a week starting Jan. 19. "Midcentury Motorama" is the name of the ambitious new GM offering, which is expected to be on a par, from the spectacle standpoint, with the "Transportation Unlimited" showing of a year ago. Of historical interest will be the backgrounds for each of the five GM lines indicating the advances in each since the first cars were made early in the century.

Willys-Overland Motors, Inc., has transferred its station wagon body building job from Briggs Mfg. Co., Detroit, to its Toledo plant. Tools, dies, jigs, and fixtures are being moved alongside those for the Jeep bodies, whose output was centralized in Toledo a year ago. This will give Willys a compact manufacturing operation which should be reflected in more efficiency and lower costs.



***STUDEBAKER'S AUTOMATIC TRANSMISSION,** made by Borg-Warner, is adaptable to the standard engine. In the position shown here single disc clutch is hydraulically engaged and torque converter is immobilized and turns as a flywheel only, transmitting no power. This makes it possible to use air cooling only. The torque converter is a separate unit from the transmission and when assembled is "submerged arc" welded at the peripheral joint of the two halves. For service it is replaced as a unit. To take apart, the weld is turned off and when rebuilt it is rewelded the same as originally*

Names in the News

Eugene P. Berg

Richard Moyer

Eugene P. Berg, formerly general supt., has been named asst. general manager of the Link-Belt Pershing Road plant, Chicago. **Richard Moyer,** formerly supt. of the steel shop, has been named general supt., manufacturing dept. Other appointments at the Pershing Road plant: **Stanley F. Zale,** supt., steel shop; **Ray Witt,** supervisor, time study and methods dept.; **Harold Hartman,** chief inspector.

Frank Willmott, Chicago district sales manager of E. W. Bliss Co., Toledo, has retired after 24 years' service. He started his 43-year career in metalworking as an apprentice die maker with J. Stevens Arms Co. and served consecutively with Stevens Duryea Automobile Co., Continental Motors, Chalmers Motor Co., Oakes Stamping, and Nordyke & Marmon Co. He joined the Toledo Machine & Tool Div. of Bliss in 1923 as sales engineer. **Bernard E. Meyer** has been named to succeed Mr. Willmott.

Howard D. Williams of Washington Mills Abrasive Co., North Grafton, Mass., has been elected president of the Smaller Business Assn. of New England.

Thomas A. Daly has been named engineering manager in charge of all Westinghouse Electric Corp.'s Naval Ordnance work at Sharon, Pa. **J. O. Clevenger** has been named manager of the Westinghouse welding dept., Buffalo, N. Y. and **J. P. Coughlin** has been named manager of field sales in the welding dept.

Eric Dudley has been named manager of aviation development and manager of the Pacific Coast district of Tinnerman Products, Inc., Cleveland. Prior to joining Tinnerman in 1946, he was production manager of Boots Aircraft Nut Corp., Stamford, Conn., and before that was assistant to the director of engineering for Curtiss-Wright Corp.'s Aviation Div., Columbus, Ohio.

John T. Wetzel has been named plant manager, Tube Reducing Corp., Wallington, N. J. He was formerly assistant to the president of Curtiss Wright Corp.

Morse G. Dial has been elected a director, and **Kenneth H. Hannan** elected secretary of Union Carbide & Carbon Corp. Mr. Dial has been a vice president since August, 1949.

Mathews Dick, Jr., has been appointed sales engineer in the Chicago area by Butterfield Div. of Union Twist Drill Co., Derby Line, Vt.

Leonard A. Ashworth will represent Continental Screw Co., New Bedford, Mass., in Maine, New Hampshire, Vermont and Connecticut. **Robert A. McCormick** will take over the New York metropolitan area which Mr. Ashworth leaves. **Paul R. Flemming,** a new Continental representative, is covering New York State and a portion of Pennsylvania.

David T. Marvel has been named general sales manager, Western Brass Mills Div., Olin Industries, Inc., East Alton, Ill.

David T. Marvel

G. K. Eggleston

G. K. Eggleston has been named vice president in charge of manufacturing, Non-Ferrous Perma Mold, Inc., Mansfield, Ohio. **S. E. Gregory** has been named general sales manager. Mr. Eggleston was previously vice president of engineering for Barnes Mfg. Co. Mr. Gregory was associated for 12 years with Non-Ferrous Die Casting Co., Ltd., London.

Arthur J. Renz has been named field engineer on precision spindle applications by Pope Machinery Corp., Haverhill, Mass.

Neil Currie, Jr., former manager of manufacturing, has been named administrative assistant to the general manager of General Electric Co.'s Apparatus Dept., Schenectady, N. Y. **F. B. Law** has been named manager of manufacturing for GE's Aeronautic and Ordnance Systems Div., succeeding **Frank T. Lewis,** named manager of manufacturing, Small Apparatus Div. Other appointments: **Carl A. Salmonsen,** manager of manufacturing, Large Apparatus Div.; **Byron A. Case,** manager of engineering, Small Apparatus Div.; **Clarence H. Linder,** assistant to the general manager, Apparatus Dept.; **C. W. LaPierre,** manager, Aircraft Gas Turbine Div.; **D. S. MacDonald,** assistant to the manager of the gear motor sales division of the Small & Medium Motor Div.

Neil Currie, Jr.

Harry C. Platt

William H. Starbuck

Harry C. Platt has been named vice president of the Engineered Castings Div. and **William H. Starbuck** vice president of the Kellog Div. of American Brake Shoe Co., New York. Mr. Platt was formerly works manager; Mr. Starbuck, formerly asst. general sales manager.

J. C. Stites has been named assistant manager of sales and export sales manager, Cleveland Twist Drill Co. He succeeds the late **H. P. Jenson. R. O. Artner,** formerly manager of the Detroit stockroom, has been promoted to the field sales div.

Earle W. Pughe, assistant to the president of Dana Corp., Toledo, has become manager of the manufacturing division of Wheland Co., Chattanooga, Tenn. He was with Chevrolet Div. of General Motors for 22 years prior to joining Dana.

Martvig J. Moll has been named manager of conveyor sales, Hanson-Van Winkle-Munning Co., Matawan, N. J. **P. R. Lyons,** previously district manager of Ohio, has been named manager of electrical sales. **Irving A. Gemmell** has been named assistant manager of conveyor sales. **Wilfred G. Cryderman,** covering the southern Ohio territory, has been transferred to the Cleveland office. **Gordon Lyons** has been named sales representative in Dayton, Ohio.

MEETINGS

Jan. 10-14—Society of Automotive Engineers, Inc., annual meeting and engineering display; Book-Cadillac Hotel, Detroit.

16-19 — First National Plant Maintenance Show; public auditorium, Cleveland.

18-20—American Management Assn., General Management Conference; St. Francis Hotel, San Francisco.

Daniel J. Haughton has been named president of two Lockheed Aircraft Corp. subsidiaries, the Airquipment Corp., and Aerol Co., Inc., Burbank, Calif. He replaces **Newman L. Smith,** resigned. Mr. Haughton has been assistant to the vice president in charge of manufacturing at Lockheed for several years. Previously he served as coordinator in the manufacturing branches of Lockheed and its wartime subsidiary, Vega Aircraft Corp. **Burt C. Monesmith** has been named to succeed Mr. Haughton as assistant to the vice president; **G. A. Fitzpatrick,** former supt. of Lockheed's jet fighter production, succeeds Mr. Monesmith as works manager.

Mark Gardner has been elected president, International Derrick & Equipment Co., Cleveland, a subsidiary of Dresser Industries, Inc. He succeeds **Oscar M. Havekotte,** resigned. Also elected a director, Mr. Gardner will make his headquarters in Dallas, Texas, where the company's offices are being moved.

Robert A. Speck and **George R. Milne** have been named vice presidents of National Carbide Corp., New York, Mr. Speck being in charge of sales and distribution and Mr. Milne in charge of operations. **Russell T. Lund** has been named operating manager. Other appointments: **Astor Brown,** acting works manager at Ivanhoe, Va.; **Clarence G. Burnham,** controller; **W. P. Metcalf,** purchasing agent; **R. J. Niebanck,** technical assistant to the president.

Glenn H. Edgecomb, formerly works manager of Holtzer-Cabot Electric Co., Boston, has joined Jack & Heintz Precision Industries, Inc., as works manager. During the war he was with Bendix Corp., Philadelphia div., and in 1944 left to become works manager of Sonatone Corp., Elmsford, N. Y.

Fred G. Baker has been named director of engineering and design, Electro Chemical Supply & Engineering Co., Emmaus, Pa.

Bernard W. Weber has been named manager of the East Chicago, Ind., detinning and electrode manufacturing plant of Metal & Thermit Corp., New York. **W. S. Leinhardt,** formerly general superintendent at that plant, is now in the New York executive offices as technical assistant to the vice president of production. District manager appointments: **William C. Cuntz,** Chicago; **Orville T. Barnette,** Pittsburgh; **Robert T. Brown,** Newark.

Obituaries

Ben Sloan, 66, for 30 years the Newark, N. J., representative of Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn., died Nov. 17.

Albert A. Criqui, 67, consulting engineer for Buffalo Forge Co., Buffalo, N. Y., died Nov. 7. He was chief engineer at Buffalo Forge from 1915 to 1948.

Fred R. Klaus, 75, vice president and general manager of United Mfg. Co., Cleveland, died Nov. 24. He had been cofounder and president of Cleveland Welding Co., then took over plant management of American Welding Mfg. Co., Warren, Ohio, and later founded United Wheel & Rim Co. in Warren, serving as its president for a number of years. Before forming United, he was chief engineer for the wheel division of Eberhard Mfg. Co., Cleveland.

Jesse E. Dowley, 65, president and general manager of Calvan Machine Products Corp., Jackson, Mich., died Nov. 9. He had worked on the production lines of Adams Axle Co. and American Gear Co. Leaving the gear firm in 1920 he organized National Machine & Tool Co. in Jackson, which he sold in 1941 to organize the Calvan corporation.

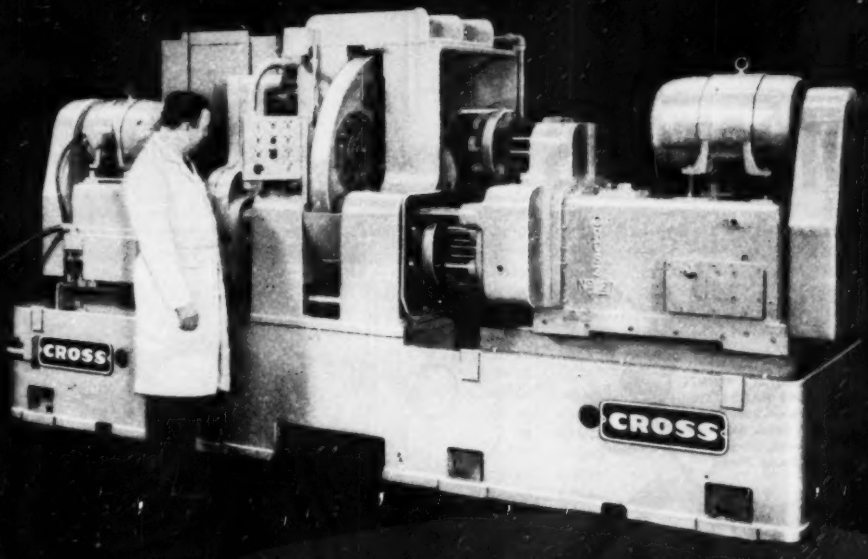
Alvin G. Raddatz, 56, vice president of Lakeshore Machinery & Supply Co., Muskegon, Mich., died Nov. 2. Formerly president of Lakeshore Machine Co., which he founded in Muskegon, Mr. Raddatz was named vice president of Lakeshore Machinery & Supply Co. in 1933 after a merger of companies.

George H. Knebusch, 66, plant superintendent of Cleveland Steel Tool Co. for 20 years, died Nov. 17. He retired last year.

Robert F. Crudginton, 68, former works manager of Underwood-Elliott-Fisher Co., Bridgeport, Conn., died Nov. 13.

Daniel B. DeLand, 64, assistant to the vice president in charge of manufacturing, American Can Co., New York, died Nov. 14.

Another Special by Cross



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★ Fluid motor drive for indexing.

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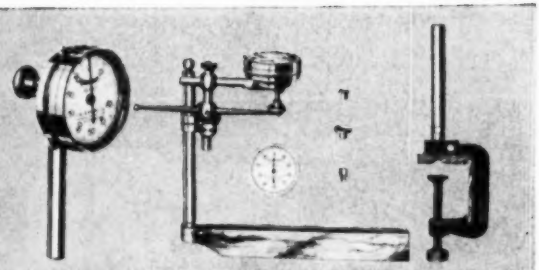
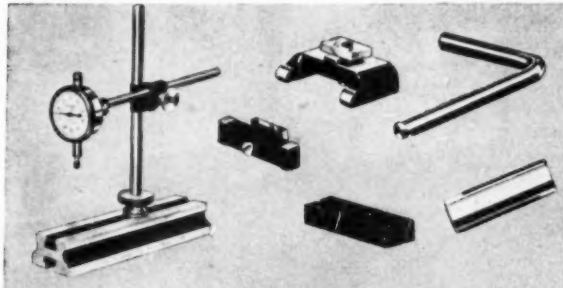
NEW, HANDY POINT SELECTOR. A complete range of 4 standard, 9 special forms and a shock absorbing point — mounted for quick selection and safekeeping in a light, convenient aluminum ring. Order yours today through your distributor.

FREE. Quick-trace Transfer Chart and Dimension Chart for all Starrett Dial Indicators. Write for them. Also for complete Starrett Dial Indicator Catalog "C".



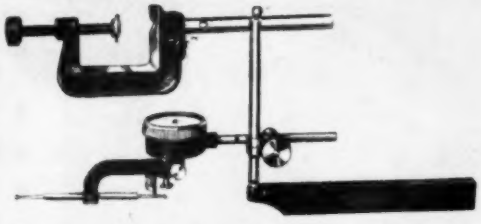
UNIVERSAL DIAL TEST INDICATOR No. 196

Simple, reliable, sensitive, easy to read, easy to set up and use — a favorite with toolmakers, machinists and inspectors. Special attachments provide for universal application to all classes of work. Dial graduated .001", reading 0-100, range .200". Also available to read 0-50-0, 0-20-0 and 0-40 by thousandths, range approximately .200"



DIAL TEST INDICATOR No. 665

A sturdy and heavier built combination for inspectors, erectors, machinists and toolmakers. Attachments providing for infinite adjustment include horizontal and right angle arm, tool post holder, keyway and guide steps. Choice of dial indicators.



HEAVY DUTY DIAL TEST INDICATOR No. 645

Similar to No. 196 but proportionately heavier for severe applications around machinery or for continuous use in general tool work, No. 645 has a special, spiral-type mechanism of unusually rugged construction. Combines sensitive, accurate action with easy-to-read dial. Supplied with 0-50-0 or 0-100 dial, graduated in thousandths, range .200".

Starrett

Standard of Precision

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • HACKSAWS BAND SAWS AND BAND KNIVES • PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

THE L. S. STARRETT CO. • *World's Greatest Toolmakers* • **ATHOL, MASSACHUSETTS, U.S.A.**

Simple Indexing...IV

BY WM. H. SIEBRECHT 3rd, GENERAL PRECISION LABORATORY, INC.

Angle	Decimal Equiv.	Hole and Plate
5° 00′ 00″	5.0000°	10/18
5° 00′ 00″	ditto	15/27
5° 00′ 00″	ditto	30/54
5° 1′ 24″	5.0233°	24/43
5° 1′ 46″	5.0294°	19/34
5° 2′ 44″	5.0454°	37/66
5° 2′ 56″	5.0488°	23/41
5° 3′ 45″	5.0625°	9/16
5° 4′ 37″	5.0769°	22/39
5° 4′ 50″	5.0806°	35/62
5° 5′ 13″	5.0870°	13/23
5° 5′ 13″	ditto	26/46
5° 6′ 00″	5.1000°	17/30
5° 6′ 29″	5.1081°	21/37
5° 7′ 14″	5.1207°	33/58
5° 8′ 34″	5.1429°	12/21
5° 8′ 34″	ditto	16/28
5° 8′ 34″	ditto	24/42
5° 8′ 34″	ditto	28/49
5° 10′ 00″	5.1666°	31/54
5° 10′ 13″	5.1702°	27/47
5° 10′ 54″	5.1818°	19/33
5° 10′ 54″	ditto	38/66
5° 12′ 38″	5.2105°	11/19
5° 12′ 38″	ditto	22/38
5° 13′ 33″	5.2258°	18/31
5° 13′ 33″	ditto	36/62
5° 13′ 57″	5.2326°	25/43
5° 15′ 00″	5.2500°	14/24
5° 16′ 6″	5.2683°	24/41
5° 16′ 33″	5.2759°	17/29
5° 16′ 33″	5.2759°	34/58
5° 16′ 57″	5.2826°	27/46
5° 17′ 39″	5.2941°	10/17
5° 17′ 39″	ditto	20/34
5° 18′ 28″	5.3077°	23/39
5° 19′ 5″	5.3182°	39/66
5° 19′ 36″	**5.3265°**	29/49
5° 20′ 00″	5.3333°	16/27
5° 20′ 00″	ditto	32/54
5° 21′ 5″	5.3514°	22/37
5° 21′ 26″	5.3571°	25/42
5° 21′ 42″	5.3617°	28/47
5° 22′ 15″	5.3710°	37/62
5° 24′ 00″	5.4000°	9/15
5° 24′ 00″	ditto	12/20
5° 24′ 00″	ditto	18/30
5° 25′ 52″	5.4310°	35/58
5° 26′ 31″	5.4419°	26/43
5° 26′ 51″	5.4474°	23/38
5° 27′ 16″	5.4545°	20/33
5° 27′ 16″	ditto	40/66
5° 27′ 51″	5.4643°	17/28
5° 28′ 42″	5.4783°	14/23
5° 28′ 42″	ditto	28/46
5° 29′ 16″	5.4878°	25/41
5° 30′ 00″	5.5000°	11/18
5° 30′ 00″	ditto	33/54
5° 30′ 37″	5.5102°	30/49
5° 30′ 58″	5.5161°	19/31
5° 30′ 58″	ditto	38/62
5° 32′ 18″	5.5385°	24/39
5° 33′ 11″	5.5532°	29/47
5° 33′ 32″	5.5588°	21/34
5° 34′ 17″	5.5714°	13/21
5° 34′ 17″	ditto	26/42
5° 35′ 10″	5.5862°	18/29
5° 35′ 10″	ditto	36/58
5° 35′ 27″	5.5909°	41/66
5° 35′ 41″	5.5946°	23/37
5° 37′ 30″	5.6250°	10/16
5° 37′ 30″	ditto	15/24
5° 39′ 4″	5.6512°	27/43
5° 39′ 41″	5.6613°	39/62
5° 40′ 00″	5.6666°	17/27
5° 40′ 00″	ditto	34/54
5° 40′ 26″	5.6739°	29/46
5° 41′ 3″	5.6842°	12/19
5° 41′ 3″	ditto	24/38
5° 41′ 38″	5.6939°	31/49
5° 42′ 00″	5.7000°	19/30
5° 42′ 26″	5.7073°	26/41
5° 43′ 38″	5.7272°	21/33
5° 43′ 38″	ditto	42/66
5° 44′ 29″	5.7414°	37/58
5° 44′ 41″	5.7447°	30/47
5° 46′ 9″	5.7692°	25/39
5° 47′ 9″	5.7857°	18/28
5° 47′ 9″	ditto	27/42
5° 48′ 23″	5.8065°	20/31
5° 48′ 23″	ditto	40/62
5° 49′ 25″	5.8235°	11/17
5° 49′ 25″	ditto	22/34
5° 50′ 00″	5.8333°	35/54
5° 50′ 16″	5.8378°	24/37
5° 51′ 00″	5.8500°	13/20
5° 51′ 38″	5.8605°	28/43
5° 51′ 49″	5.8636°	43/66
5° 52′ 10″	5.8696°	15/23
5° 52′ 10″	ditto	30/46
5° 52′ 39″	5.8776°	32/49
5° 53′ 48″	5.8966°	19/29
5° 53′ 48″	ditto	38/58
5° 55′ 16″	5.9211°	25/38
5° 55′ 37″	5.9268°	27/41
5° 56′ 10″	5.9362°	31/47
5° 57′ 6″	5.9516°	41/62
6° 00′ 00″	6.0000°	10/15
6° 00′ 00″	ditto	12/18
6° 00′ 00″	ditto	14/21
6° 00′ 00″	ditto	16/24
6° 00′ 00″	ditto	18/27
6° 00′ 00″	ditto	20/30
6° 00′ 00″	ditto	22/33
6° 00′ 00″	ditto	26/39
6° 00′ 00″	ditto	28/42
6° 00′ 00″	ditto	36/54
6° 00′ 00″	ditto	44/66
6° 3′ 6″	6.0517°	39/58
6° 3′ 40″	6.0612°	33/49
6° 3′ 55″	6.0652°	31/46
6° 4′ 11″	6.0698°	29/43
6° 4′ 52″	6.0811°	25/37
6° 5′ 18″	6.0882°	23/34
6° 5′ 48″	6.0968°	21/31
6° 5′ 48″	ditto	42/62
6° 6′ 26″	6.1071°	19/28
6° 7′ 40″	6.1277°	32/47
6° 8′ 11″	6.1364°	45/66
6° 8′ 47″	6.1463°	28/41
6° 9′ 28″	6.1579°	13/19
6° 9′ 28″	6.1579°	26/38
6° 10′ 00″	6.1666°	37/54
6° 11′ 15″	6.1875°	11/16
6° 12′ 25″	6.2069°	20/29
6° 12′ 25″	ditto	40/58
6° 12′ 51″	6.2143°	29/42
6° 13′ 51″	6.2308°	27/39
6° 14′ 31″	6.2419°	43/62
6° 14′ 42″	6.2449°	34/49
6° 15′ 39″	6.2609°	16/23
6° 15′ 39″	ditto	32/46
6° 16′ 22″	6.2727°	23/33
6° 16′ 22″	ditto	46/66
6° 16′ 45″	6.2791°	30/43
6° 18′ 00″	6.3000°	14/20
6° 18′ 00″	ditto	21/30
6° 19′ 9″	6.3191°	33/47
6° 19′ 28″	6.3243°	26/37
6° 20′ 00″	6.3333°	19/27
6° 20′ 00″	ditto	38/54
6° 21′ 11″	6.3529°	12/17
6° 21′ 11″	ditto	24/34
6° 21′ 43″	6.3621°	41/58
6° 21′ 57″	6.3659°	29/41
6° 22′ 30″	6.3750°	17/24
6° 23′ 14″	6.3871°	22/31
6° 23′ 14″	ditto	44/62
6° 23′ 41″	6.3947°	27/38
6° 24′ 33″	6.4091°	47/66
6° 25′ 43″	6.4286°	15/21
6° 25′ 43″	ditto	20/28
6° 25′ 43″	ditto	30/42
6° 25′ 43″	ditto	35/49
6° 27′ 23″	6.4565°	33/46
6° 27′ 42″	6.4615°	28/39
6° 29′ 18″	6.4884°	31/43
6° 30′ 00″	6.5000°	13/18
6° 30′ 00″	ditto	39/54
6° 30′ 38″	6.5106°	34/47
6° 31′ 2″	6.5172°	21/29
6° 31′ 2″	ditto	42/58
6° 31′ 56″	6.5323°	45/62
6° 32′ 44″	6.5454°	24/33
6° 32′ 44″	ditto	48/66
6° 34′ 3″	6.5676°	27/37
6° 35′ 7″	6.5854°	30/41
6° 36′ 00″	6.6000°	11/15
6° 36′ 00″	ditto	22/30
6° 36′ 44″	6.6122°	36/49
6° 37′ 4″	6.6176°	25/34
6° 37′ 54″	6.6316°	14/19
6° 37′ 54″	ditto	28/38
6° 38′ 34″	6.6429°	31/42
6° 39′ 8″	6.6522°	17/23
6° 39′ 8″	ditto	34/46
6° 40′ 00″	6.6666°	20/27
6° 40′ 00″	ditto	40/54
6° 40′ 21″	6.6724°	43/58
6° 40′ 39″	6.6774°	23/31
6° 40′ 39″	ditto	46/62
6° 40′ 54″	6.6818°	49/66
6° 41′ 32″	6.6923°	29/39
6° 41′ 52″	6.6977°	32/43
6° 42′ 8″	6.7021°	35/47
6° 45′ 00″	6.7500°	12/16
6° 45′ 00″	ditto	15/20
6° 45′ 00″	ditto	18/24
6° 45′ 00″	ditto	21/28
6° 47′ 45″	6.7959°	37/49
6° 48′ 18″	6.8049°	31/41
6° 48′ 39″	6.8108°	28/37
6° 49′ 5″	6.8182°	25/33
6° 49′ 5″	ditto	50/66
6° 49′ 21″	6.8226°	47/62
6° 49′ 39″	6.8276°	22/29
6° 49′ 39″	6.8276°	44/58
6° 50′ 00″	6.8333°	41/54
6° 50′ 52″	6.8478°	35/46
6° 51′ 26″	6.8571°	16/21
6° 51′ 26″	ditto	32/42
6° 52′ 6″	6.8684°	29/38
6° 52′ 56″	6.8824°	13/17
6° 52′ 56″	ditto	26/34
6° 53′ 37″	6.8936°	36/47
6° 54′ 00″	6.9000°	23/30

INVESTIGATE *Surface Broaching* FOR DIFFICULT MACHINING WORK

Throughout the metal working field there are many parts that can be surface broached at remarkable savings over the costs of the present machining method.

The aircraft, automotive, small tool, appliance and even sporting goods manufacturers have all found ways of making parts faster, cheaper and to finer tolerances through the use of Footburt Surface Broaching Machines. We will be glad to work with you on the application of surface broaching.

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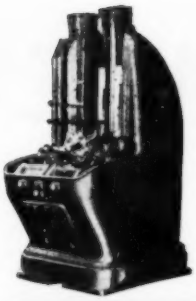


Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

Continuous Type Machine. Made in 4 Sizes.

FOOTBURT SURFACE BROACHING

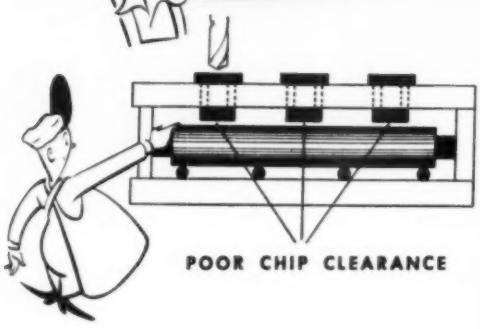
A TIME TESTED LINE OF MACHINE TOOLS

Simple Indexing...V

Angle	Decimal Equiv.	Hole and Plate
6° 54′ 25″	6.9070°	33/43
6° 55′ 23″	6.9231°	30/39
6° 57′ 16″	6.9545°	51/66
6° 58′ 4″	6.9677°	24/31
6° 58′ 4″	ditto	48/62
6° 58′ 47″	6.9796°	38/49
6° 58′ 58″	6.9828°	45/58
7° 00′ 00″	7.0000°	14/18
7° 00′ 00″	ditto	21/27
7° 00′ 00″	ditto	42/54
7° 1′ 28″	7.0244°	32/41
7° 2′ 36″	7.0435°	18/23
7° 2′ 36″	ditto	36/46
7° 3′ 15″	7.0541°	29/37
7° 4′ 17″	7.0714°	22/28
7° 4′ 17″	7.0714°	33/42
7° 5′ 6″	7.0851°	37/47
7° 5′ 27″	7.0909°	26/33
7° 5′ 27″	ditto	52/66
7° 6′ 19″	7.1053°	15/19
7° 6′ 19″	ditto	30/38
7° 6′ 46″	7.1129°	49/62
7° 6′ 59″	7.1163°	34/43
7° 7′ 30″	7.1250°	19/24
7° 8′ 17″	7.1379°	23/29
7° 8′ 17″	ditto	46/58
7° 8′ 49″	7.1471°	27/34
7° 9′ 14″	7.1538°	31/39
7° 9′ 48″	7.1633°	39/49
7° 10′ 00″	7.1666°	43/54
7° 12′ 00″	7.2000°	12/15
7° 12′ 00″	ditto	16/20
7° 12′ 00″	ditto	24/30
7° 13′ 38″	7.2272°	53/66
7° 14′ 21″	7.2391°	37/46
7° 14′ 28″	7.2439°	33/41
7° 15′ 29″	7.2581°	25/31
7° 15′ 29″	ditto	50/62
7° 16′ 36″	7.2766°	38/47
7° 17′ 9″	7.2857°	17/21
7° 17′ 9″	7.2857°	34/42
7° 17′ 35″	7.2931°	47/58
7° 17′ 50″	7.2973°	30/37
7° 18′ 45″	7.3125°	13/16
7° 19′ 32″	7.3256°	35/43
7° 20′ 00″	7.3333°	22/27
7° 20′ 00″	ditto	44/54
7° 20′ 32″	7.3421°	31/38
7° 20′ 49″	7.3469°	40/49
7° 21′ 49″	7.3636°	27/33
7° 21′ 49″	ditto	54/66
7° 23′ 5″	7.3846°	32/39
7° 23′ 34″	7.3929°	23/28
7° 24′ 12″	7.4032°	51/62
7° 24′ 42″	7.4118°	14/17
7° 24′ 42″	ditto	28/34
7° 26′ 5″	7.4348°	19/23
7° 26′ 5″	ditto	38/46
7° 26′ 54″	7.4483°	24/29
7° 26′ 54″	ditto	48/58
7° 27′ 48″	7.4634°	34/41
7° 28′ 5″	7.4681°	39/47
7° 30′ 00″	7.5000°	15/18
7° 30′ 00″	ditto	20/24
7° 30′ 00″	ditto	25/30
7° 30′ 00″	7.5000°	35/42
7° 30′ 00″	ditto	45/54
7° 30′ 00″	ditto	55/66
7° 31′ 50″	7.5306°	41/49
7° 32′ 6″	7.5349°	36/43
7° 32′ 26″	7.5405°	31/37
7° 32′ 54″	7.5484°	26/31
7° 32′ 54″	ditto	52/62
7° 34′ 44″	7.5789°	16/19
7° 34′ 44″	ditto	32/38
7° 36′ 12″	7.6034°	49/58
7° 36′ 55″	7.6154°	33/39
7° 37′ 50″	7.6304°	39/46
7° 38′ 11″	7.6364°	28/33
7° 38′ 11″	ditto	56/66
7° 39′ 00″	7.6500°	17/20
7° 39′ 34″	7.6596°	40/47
7° 40′ 00″	7.6666°	23/27
7° 40′ 00″	ditto	46/54
7° 40′ 35″	7.6765°	29/34
7° 40′ 59″	7.6829°	35/41
7° 41′ 37″	7.6935°	53/62
7° 42′ 51″	7.7143°	18/21
7° 42′ 51″	ditto	24/28
7° 42′ 51″	ditto	36/42
7° 42′ 51″	7.7143°	42/49
7° 44′ 39″	7.7442°	37/43
7° 45′ 31″	7.7586°	25/29
7° 45′ 31″	ditto	50/58
7° 46′ 22″	7.7727°	57/66
7° 47′ 2″	7.7838°	32/37
7° 48′ 00″	7.8000°	13/15
7° 48′ 00″	ditto	26/30
7° 48′ 57″	7.8158°	33/38
7° 49′ 34″	7.8261°	20/23
7° 49′ 34″	ditto	40/46
7° 50′ 00″	7.8333°	47/54
7° 50′ 19″	7.8387°	27/31
7° 50′ 19″	ditto	54/62
7° 50′ 46″	7.8462°	34/39
7° 51′ 4″	7.8511°	41/47
7° 52′ 30″	7.8750°	14/16
7° 52′ 30″	ditto	21/24
7° 53′ 53″	7.8980°	43/49
7° 54′ 9″	7.9024°	36/41
7° 54′ 33″	7.9091°	29/33
7° 54′ 33″	ditto	58/66
7° 54′ 50″	7.9138°	51/58
7° 55′ 43″	7.9286°	37/42
7° 56′ 28″	7.9412°	15/17
7° 56′ 28″	7.9412°	30/34
7° 57′ 13″	7.9535°	38/43
7° 59′ 2″	7.9839°	55/62
8° 00′ 00″	8.0000°	16/18
8° 00′ 00″	ditto	24/27
8° 00′ 00″	ditto	48/54
8° 1′ 18″	8.0217°	41/46
8° 1′ 37″	8.0270°	33/37
8° 2′ 9″	8.0357°	25/28
8° 2′ 33″	8.0426°	42/47
8° 2′ 44″	8.0454°	59/66
8° 3′ 9″	8.0526°	17/19
8° 3′ 9″	ditto	34/38
8° 4′ 8″	8.0690°	26/29
8° 4′ 8″	ditto	52/58
8° 4′ 37″	8.0769°	35/39
8° 4′ 54″	8.0816°	44/49
8° 6′ 00″	8.1000°	18/20
8° 6′ 00″	ditto	27/30
8° 7′ 19″	8.1220°	37/41
8° 7′ 45″	8.1290°	28/31
8° 7′ 45″	ditto	56/62
8° 8′ 34″	8.1429°	19/21
8° 8′ 34″	ditto	38/42
8° 9′ 46″	8.1628°	39/43
8° 10′ 00″	8.1666°	49/54
8° 10′ 54″	8.1818°	30/33
8° 10′ 54″	ditto	60/66
8° 12′ 21″	8.2059°	31/34
8° 13′ 3″	8.2174°	21/23
8° 13′ 3″	ditto	42/46
8° 13′ 27″	8.2241°	53/58
8° 14′ 3″	8.2340°	43/47
8° 15′ 00″	8.2500°	22/24
8° 15′ 55″	8.2653°	45/49
8° 16′ 13″	8.2703°	34/37
8° 16′ 27″	8.2742°	57/62
8° 17′ 22″	8.2895°	35/38
8° 18′ 28″	8.3077°	36/39
8° 19′ 5″	8.3182°	61/66
8° 20′ 00″	8.3333°	25/27
8° 20′ 00″	ditto	50/54
8° 20′ 29″	8.3415°	38/41
8° 21′ 26″	8.3571°	26/28
8° 21′ 26″	ditto	39/42
8° 22′ 20″	8.3721°	40/43
8° 22′ 46″	8.3793°	27/29
8° 22′ 46″	ditto	54/58
8° 24′ 00″	8.4000°	14/15
8° 24′ 00″	ditto	28/30
8° 24′ 47″	8.4130°	43/46
8° 25′ 10″	8.4194°	29/31
8° 25′ 10″	ditto	58/62
8° 25′ 32″	8.4255°	44/47
8° 26′ 15″	8.4375°	15/16
8° 26′ 56″	8.4490°	46/49
8° 27′ 16″	8.4545°	31/33
8° 27′ 16″	ditto	62/66
8° 28′ 14″	8.4706°	16/17
8° 28′ 14″	ditto	32/34
8° 30′ 00″	8.5000°	17/18
8° 30′ 00″	ditto	51/54
8° 30′ 49″	8.5135°	35/37
8° 31′ 35″	8.5263°	18/19
8° 31′ 35″	ditto	36/38
8° 32′ 4″	8.5345°	55/58
8° 32′ 18″	8.5385°	37/39
8° 33′ 00″	8.5500°	19/20
8° 33′ 40″	8.5610°	39/41
8° 33′ 52″	8.5645°	59/62
8° 34′ 17″	8.5714°	20/21
8° 34′ 17″	ditto	40/42
8° 34′ 53″	8.5814°	41/43
8° 35′ 27″	8.5909°	60/66
8° 36′ 31″	8.6087°	22/23
8° 36′ 31″	8.6087°	44/46
8° 37′ 1″	8.6170°	45/47
8° 37′ 30″	8.6250°	23/24
8° 37′ 58″	8.6327°	47/49
8° 40′ 00″	8.6666°	26/27
8° 40′ 00″	ditto	52/54
8° 40′ 43″	8.6786°	27/28
8° 41′ 23″	8.6897°	28/29
8° 41′ 23″	ditto	56/58
8° 42′ 00″	8.7000°	29/30
8° 42′ 35″	8.7097°	30/31
8° 42′ 35″	ditto	60/62
8° 43′ 38″	8.7272°	32/33
8° 43′ 38″	ditto	64/66
8° 44′ 7″	8.7353°	33/34
8° 45′ 24″	8.7568°	36/37
8° 45′ 47″	8.7632°	37/38
8° 46′ 9″	8.7692°	38/39
8° 46′ 50″	8.7805°	40/41
8° 47′ 9″	8.7857°	41/42
8° 47′ 27″	8.7907°	42/43
8° 48′ 16″	8.8043°	45/46
8° 48′ 31″	8.8085°	46/47
8° 48′ 59″	8.8163°	48/49
8° 50′ 00″	8.8333°	53/54
8° 50′ 41″	8.8448°	57/58
8° 51′ 17″	8.8548°	61/62
8° 51′ 49″	8.8636°	65/66

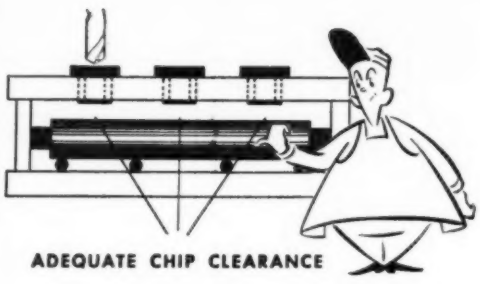
Design of Drill Bushings is Important

Stainless Sam says



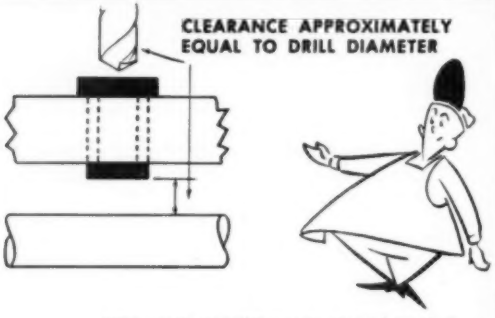
POOR CHIP CLEARANCE

1 A screw machine shop was having trouble with poor drill life and poor chip clearance. Stainless Sam learned the job called for transverse drilling of ¼"-diameter holes in 1¾"-diameter stainless steel bars. The sketch shows the original set-up of the jig.

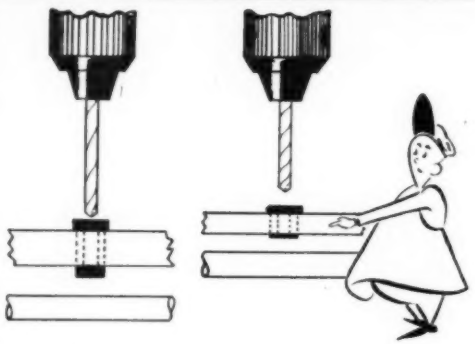


ADEQUATE CHIP CLEARANCE

2 This sketch shows the changes in bushing design recommended by Stainless Sam. *Drill bushings were ground away* to permit adequate chip clearance. This also eliminated the cause of excessive drill-breakage. In the original design, where chip clearance was inadequate, *the drill was forced to recut its own chips.*



3 When machining stainless steels, the minimum clearance between the bottom of the bushing and the work piece should be at least equal to the diameter of the drill, according to Stainless Sam. For example, a ¾"-diameter drill should have chip clearance of ¾". This may vary slightly with the accuracy of drill-location.



4 Bushings, however, should never be longer than the work requires. They should be as short as good machining practice permits, because short bushings make possible the use of short drills.

Drilling Stainless Steels is only one of the many subjects discussed in Armco's valuable new booklet on machining.

Write for your copy today. It may surprise you to know how easy it is to machine Armco Stainless Steels on standard equipment. And you may be in line for another pleasant surprise if you make a cost study of each part of your product — comparing Stainless with the material you are using.

When you write for a copy of the booklet, just ask for "Machining of Armco Stainless Steels." Address Armco Steel Corporation, 3979 Curtis Street, Middletown, Ohio.

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Finishing Zinc and Zinc Base Alloys

BY JEROME L. BLEIWEIS, Metal Finishing Consultant

Cronak Process

Purpose—To prevent the development of abnormally bulky corrosion products and to increase the corrosion resistance of zinc and zinc-base alloys, the Cronak process is used.

Nature of Coatings—The coating consists of an insoluble layer carrying with it a slightly soluble film and is composed of chromates and dichromates of zinc, plus some soluble alkali-metal dichromates and chromates. The color of the coating varies from light iridescent greenish-yellow to a deep yellow-brown.

Treatment Procedure:

1. Clean the work to be treated by vapor degreasing, or by solvent cleaning followed by alkaline cleaning in a cleaner suitable for zinc or zinc-base alloys.
2. Rinse in cold water.
3. Immerse in the Cronak-treatment solution, maintained at 60 to 90 F., for 5 to 30 sec.
4. Rinse in two running cold-water rinses.
5. Dry in a blast of compressed air or a low-temperature oven, or rinse in hot water to facilitate drying.

Notes and Comments:

1. This process was developed primarily to protect zinc when it lies in contact with stagnant water or in unventilated places in which considerable moisture is present.
2. The Cronak solutions used are approximately of the following composition:

(a) For zinc and zinc base alloys

Water	1 gal.
Sulfuric acid (94% H_2SO_4 sp.gr. 1.84)	0.8 fluid oz
Sodium dichromate	1.6 to 1.7 oz

(b) For hot-dip galvanized coatings:

Water	1 gal.
Sulfuric acid	0.4 fl oz
Chromic acid	0.8 oz

3. The coating produced is somewhat like the coating produced on magnesium by the chrome-pickle treatment.
4. The Cronak coating is not recommended as a paint base. For this purpose a compound phosphate treatment, such as Bonderizing should be used.
5. The process was developed by New Jersey Zinc Company.

Ebonol "Z"

Purpose—To produce a jet black, hard, adherent inorganic finish on zinc and zinc-base alloys by immersion.

Nature of Coating—The coating is jet black in color and is probably composed of black molybdenum salts.

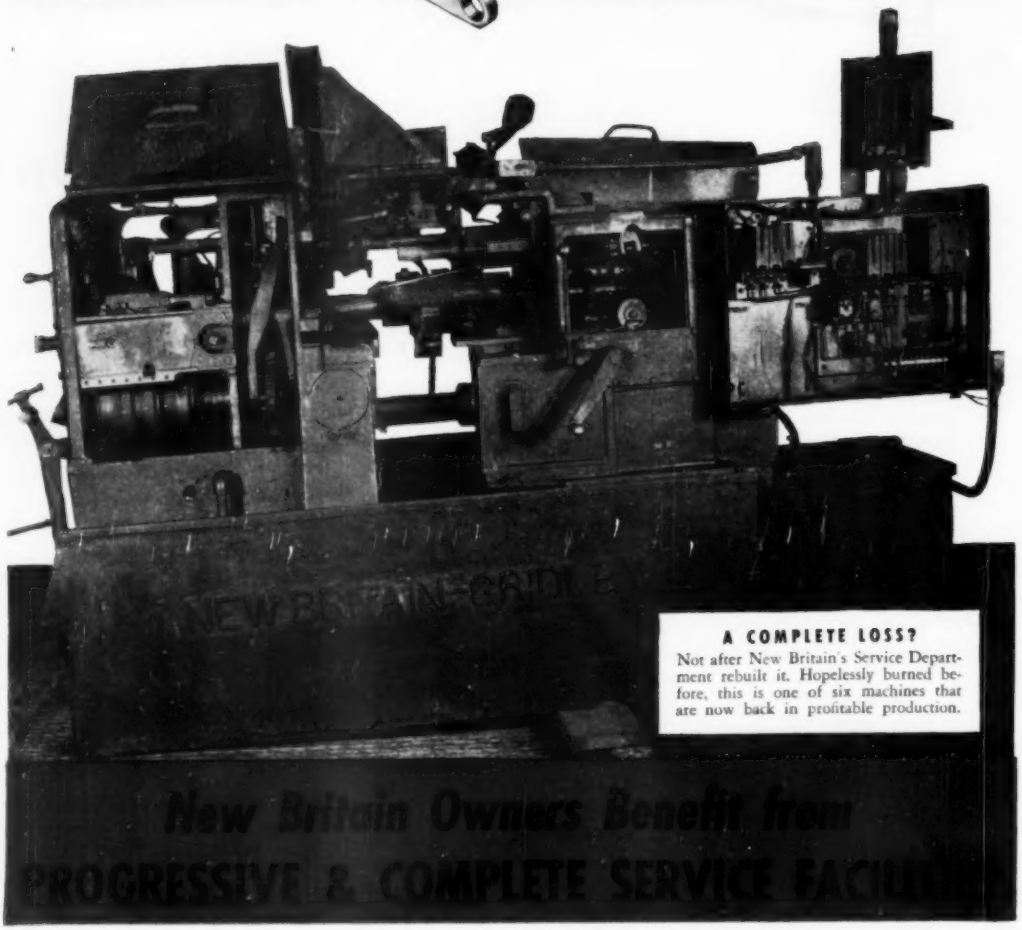
Treatment Procedure:

1. Clean parts by vapor degreasing or solvent cleaning.
2. Alkaline clean in a suitable alkaline cleaner for zinc, preferably using an anodic electro cleaner.
3. Rinse in water.
4. Pickle the work in a 5 to 10% by volume solution of muriatic acid until uniform gassing begins, to remove oxides.
5. Rinse in cold and then in hot water.
6. Immerse the work in the Ebonol "Z" solution, maintained at 180 to 200 F., for 3 to 10 min.
7. Rinse work in cold water and finally in hot water to facilitate drying.

Notes and Comments:

1. This process is applicable to electroplated zinc as well as to zinc alloys.
2. Stainless steel, nickel silver and noble metals can be blackened by making contact between the work and a sheet of pure zinc and dipping the system into the Ebonol "Z" solution.
3. The adhesion of Ebonol "Z" to highly buffed brass and chromium is poor.
4. The concentration of the solution is 1 lb of the treatment salts to a gallon of water.
5. Ebonol "Z" coatings are relatively thin and hence the dimensions of the piece treated do not change more than a few hundred-thousandths of an inch.
6. The operating temperature should be 150 to 170 F. for electroplated zinc rather than the higher temperature usually used for zinc-base alloys.
7. For additional corrosion protection, Ebonol "Z" coatings should be lacquered, enameled or oil-dipped.
8. The process does not afford the corrosion protection offered by a good organic-coating schedule.
9. The process was developed by the Enthone Corp., New Haven, Conn.

Single Part... or Complete Rebuild...


A COMPLETE LOSS?
Not after New Britain's Service Department rebuilt it. Hopelessly burned before, this is one of six machines that are now back in profitable production.
New Britain Owners Benefit from
PROGRESSIVE & COMPLETE SERVICE

STOCK OF PARTS is maintained for all standard models. Immediate shipment via air express or air freight keeps lost time at a minimum.

FIRM QUOTATIONS on rebuilding or retooling. You know in advance what the job will cost.

REGIONAL SERVICE. Factory trained service experts are located in leading manufacturing cities.

PERSONAL SERVICE AT THE FACTORY. Trained personnel are available by phone at all times to help you get the most out of your New Britain equipment. Ask for customer service department.

TELETYPE YOUR REQUIREMENTS if you wish. Our number is NBTN 94.

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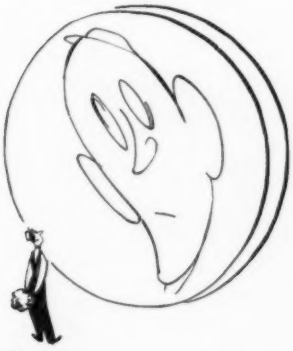
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

TALKING SHOP



Palomar

FIVE MONTHS of precision polishing by hand and machine have removed spots 20 millionths inch too high on the outer 18 in of the 200-in. Mt. Palomar mirror. Now experts are working on new aluminizing tanks for recoating the face. The original coating wasn't good enough to handle the pinpoints of light this mirror must detect and locate exactly.

In the Bag

AN ELEVATOR MANUFACTURER, confronted with the job of replacing the drive gears on one of the Pittsburgh hill elevators, balked when he discovered that the bull gear, about 20 ft dia, had wooden teeth, pegged and wedged into an annular groove in its cast-iron rim. He worried about tooth breakage and the like until the chief engineer walked him to the storeroom, kicked a gunny sack and said: "There's a full set of new teeth for that bull gear. They were there when I came on this job 40 years ago — and they're still there. We ain't used one."

Fine Finisher

BY INSTALLING new equipment that sharply reduces the number of turning machines required, and also saves two succeeding operations, one company is achieving: (1) a 2/3rds reduction in cost, and (2) an improvement in quality. Part of the latter is obtained by installing a more costly and somewhat slower machine on the third operation. It is contended that savings already realized are so great that part of them can be diverted to quality improvement.

One Large or Two Small

AT THE AGMA semi-annual meeting in Chicago, A. D. Moncrieff, assistant chief engineer of Michigan Tool Company, retold the story of the manufacturer of large gears who hired a new hand to run a large gear cutter which cut the teeth one at a time. The foreman explained the machine to the man, gave him a large gear to cut, and left him alone for two or three days until he felt that the gear was probably about finished. When he asked the man how he was getting along, he got this answer: "Oh, I'm getting along fine. There's just one thing I'd like to know before I finish. I got all the teeth cut except the last two. Would you like me to cut one great big tooth or two little ones?"

Our reason for mentioning the story is that discussion indicated that this "impossible" thing still happens. One old-time gear maker suggested a practical kink — to mark the gear periphery before cutting starts so the operator can check his progress as he goes. Another mentioned the fundamental point that the foreman shouldn't start a new man, then go away and leave him, but should keep a fairly close watch until he's satisfied as to the ability and general horse sense of the operator.

Multipiece Head

AMERICAN BRIDGE COMPANY at Gary, Ind., is currently fabricating steel for a 10,000-ton railroad bridge over the Ohio River at Cairo, Ill., to replace the 60-year-old Illinois Central Railroad bridge at that point. Unusual is the fact that the new bridge will be erected alongside present spans. As each span is completed, the corresponding span of the old bridge will be cut free, and the new section will be rolled into place on the old piers. Old spans will simply be dumped into the river, then towed ashore to be cut into scrap. This makes for minimum interruption in rail traffic. The new bridge will consist of twelve spans: two 518 ft long; four, 400 ft; and six, 197 ft; or a total of 3,900 ft.

Threads, Too

TO PRODUCE multiple die-cast parts with an internal thread, AC Spark Plug is using a motorized gear train that backs out the cores after the die opens. Threads are burnished by unscrewing of the cores. Overflow, or flash, is designed so the twisting action of backing out the cores will not tear loose the individual parts. Hence they can be trimmed in a multiple-cavity die.

Cadillac Saves Time

AIR-OPERATED CLAMPS suspended from a monorail are being used by Cadillac in conveyorized assembly. Front-end coil springs are compressed and the upper stamped member held down while operators insert bolts. The clamp handles both springs at once, assures greater safety, and is easily set for the next chassis that comes down the conveyor.

Nut runners usually are made to handle a single nut at a time. To apply all four nuts to springs clips at once, Cadillac is building a four-head nut runner, wherein the air-motor drives the four spindles by gears. Each nut is driven to proper tightness, because each spindle has its own torque clutch.

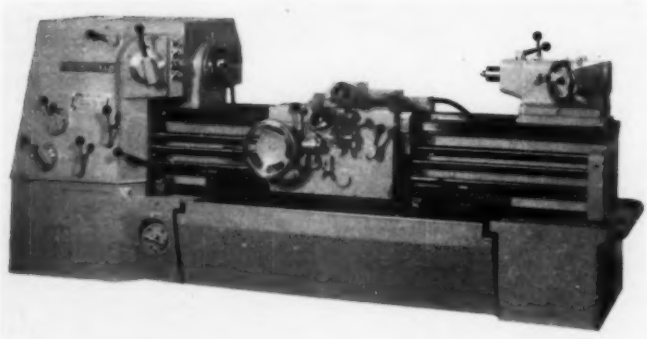
No Steps

FOR YEARS auto manufacturers have not line-reamed main bearings. Instead, they bore with flycutters. But stepped journals have persisted. Now Buick, for a new engine uses a single diameter instead of five, with the result that only four different liners are needed instead of ten. This reduction in sizes aids assembly and service.

Bad Examples

EXHIBITS of spoiled workpieces are now located in each department of the Ford Motor Company. Attention of workers is drawn to weekly spoilage by cards giving the figures and part names.

New Shop Equipment



Heavy-Duty Lathe Provides Metric, Diametral-Pitch Setups

A combination of quadrant gearing and a 60-feed gear box facilitates a quick change over from standard operations to metric-, module-, and diametral-pitch setups on the Springfield 16-in. Model S lathe. In addition the feed box includes all standard threads. The exceptionally heavy spindle gives 24 speeds and is mounted on three heavy-duty bearings. The hole through the spindle ranges to slightly in excess of 2 in. Hardened and ground gears give a speed range of 15 to 1000 rpm and higher or lower ranges can be furnished. A multiple-disk wet-type combination clutch and brake, running in a bath of oil, controls the spindle. Gearing and positive-action friction-feed clutches in the apron as well as the cross-slide and carriage rapid traverse mechanism are all automatically lubricated.

Constant Rotating Lead Screw

Anti-friction bearings are used throughout and all controls have interlocks. Both the lead screw and the large feed rod are the constant-rotating type, minimizing sagging and the collection of dust, chips, and dirt. The tailstock has two-speed action for slow drilling feeds and rapid advance. Full-depth chip and coolant pan rests on ball casters and is easily rolled out for cleaning or positioning.

Two levers, located especially convenient to the operator, control the entire 24 speed changes. One lever has two shifts; the other lever controls 12 gear changes. The shifter mechanism allows shifting directly from any speed to any other speed without the necessity of passing through intermediate points.

Location of the oil sump outside the head minimizes heat rise in the head and spindle and is especially advantageous on heavy high-speed operations. A self-cleaning oil filter is located in a recess in the front of the cabinet leg.

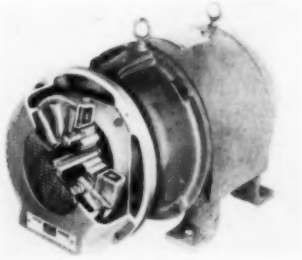
Feed gearing is completely enclosed. Oil cascades through the gears and bearing from the headstock down into the cabinet leg. Four levers control the entire 60 gear changes.

Extra Chip Clearance

The extra-wide and deep bed takes advantage of a new equilateral-triangular-type of girthing. This design gives extra chip clearance through the bed.

All motor controls and disconnects are contained in a large covered cavity at the rear of the head to eliminate the use of enclosure boxes. A complete complement of both toolroom and engine-lathe accessories and attachments, including reproducing, profiling, contouring, and other specialty units are available for the Springfield Model S.

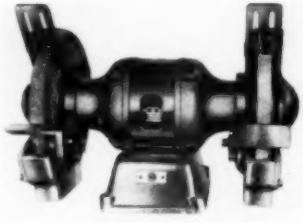
The Springfield Machine Tool Co., Springfield, Ohio



Disk-Type Electric Brake For Electric-Motor Applications

The Warner ICB electric brake is designed for mounting to standard NEMA "C" flanges. It requires 25-35 watts dc for full application. A combination of friction and electromagnetic attraction between a ring-shaped electromagnet and the armature disk gives this brake exceptionally high stopping power. It can be controlled either manually or automatically to a fine degree for machine operating cycles. By use of a simple converting unit, rectified power can be obtained from 110-, 220-, or 440 volt ac current.

The Warner Electric Brake Co., Beloit, Wis.

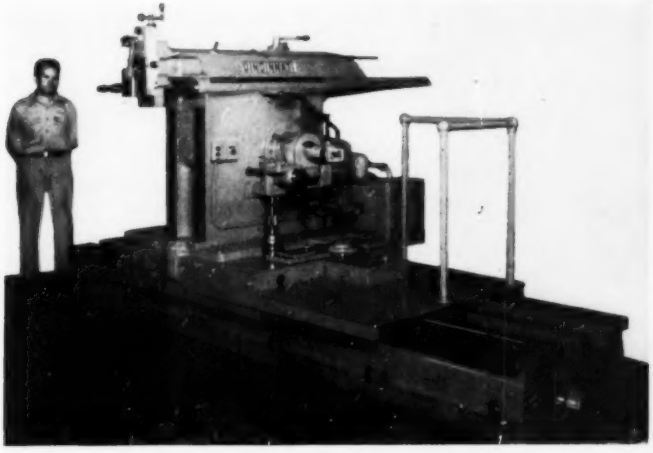


Baldor 10-in. Grinder is 17 In. Between Wheel Centers

Featuring large clearance between wheels and motor frame, the Baldor 10-in. grinder is available in single-phase, ¾-hp or three-phase, 1-hp models. Incorporating tool rests which are tiltable for angle grinding, this unit is equipped with exhaust type guards, spark breakers and sealed for life type ball bearings. Speed is 1700 rpm.

Baldor Electric Co., 4351-67 Duncan Ave., St. Louis 10, Mo.

Materials and Parts



Large-Area Shaper Employs Boring-Mill Travel Method

Employing the boring-mill travel method, this machine can shape a surface requiring up to 8-ft table travel without need for resetting the workpiece. Longer table travel can be obtained by lengthening the ways. The shaper is built with a 36-in. ram stroke and has either hand or power feed and built-in power rapid traverse. Automatic oil systems, one for the shaper ram, feed, and drive mechanism and one for the saddle and ways, are provided.

Ram speeds range from 8 to 102 strokes per min. The tool slide has 9-in. vertical adjustment and power feed. The operator rides on a platform attached to the saddle. Specifically the traveling shaper was built to machine mating steps in the ends of cast-steel generator half rings, 20 ft. in diameter and weighing 7 ton. It can also be used for shaping cross slots in press beds or long die shoes or for machining long interrupted surfaces that do not lend themselves readily to regular planing operations.

The Cincinnati Shaper Co., Cincinnati, Ohio.

Honing Head Attaches to Portable Drills, Lathes

The Honall portable honing tool, for sizing and finishing holes, is recommended for generating straight round holes with accuracy to one tenth with surface finish as fine as 2 microinches R.M.S. in hardened steel. Range covered by this honing head is from 3/16 to 1 in. in all metals (except lead and babbitt), ceramics, and glass. The tool is said to be convenient for removing several thousandths of stock, or only the "last tenth" for an exact fit. It also removes distortion after hardening or after assembly of parts.

Sunnen Products Co., 7910 Manchester, St. Louis 17, Mo.

...INCLUDING

Horizontal milling machine equipped with a built-in rotary table incorporating cross feed and power rapid traverse on its saddle.....page 134

Diagonal lapping machine is reported to be capable of correcting gear errors of greater magnitude than conventional units..page 135

Automatic shear operates at 60 strokes per min and is equipped with automatic uncoiler and roll feed and stacker.....page 138

Power press brake with variable-speed arrangement, provides 20 to 50 stroke-per-min operation.....page 142

Thirty-ton double-crank punch press has 16x30-in. bolster area. Press is single-geared and standard stroke is 2 in.....page 146

Automatic magazine loading pneumatic bar-feed unit feeds stock ranging from 0-to 16-in. lengths of 5/8-in. stock.....page 148

Metal forming presses are single-action, downstroke, front and back plate gib-guided units with hand lever control.....page 150

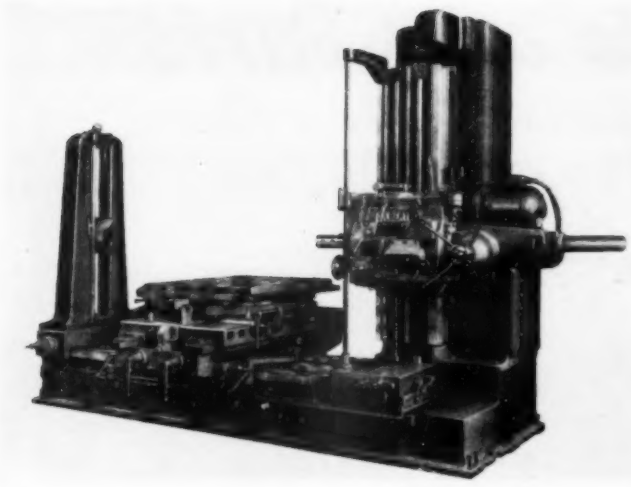
NEW BULLETINS for your Shop Library includes 65-page booklet on "cutting production costs with electronic controls" which presents 45 case histories on cost saving.....after page 195

... and in December 29

Vertical automatic production lathe is designed for negative-rake tools. Controls for setting up the machine are in a pendant panel.

Bar-feed and collet-chuck operating mechanism is hydraulic. For attachment to universal turret lathes.

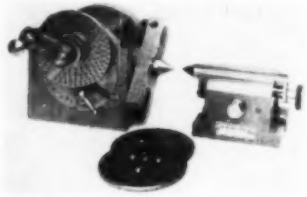
Steel is for plastic-mold cavities and force plugs. It is claimed that many intricate mold shapes can be hobbed in one operation.



Horizontal Milling Machine Has Built-in Rotary Table

Built-in rotary table with a cross feed and power rapid traverse on its saddle is an integral part of this Cincinnati Gilbert horizontal boring, drilling, and milling machine. Clamped to its base by a 47-in. dia ring clamp, the table top furnishes a working surface 44 in. in diameter or 44 in. square, and is surrounded by a coolant trough. The table top is graduated to read in ½° and can be equipped with a precision indexing device. The table can be hand-revolving or provided with 16 power feeds and rapid revolving of the table top. Single hardened 3½-in. dia spindle has maximum speed of 1420 rpm. Pressure lubrication to all running parts, anti-friction bearings throughout with spindle sleeves mounted on pre-loaded ball bearings, and a built-in reversing motor are among the other features of this machine.

The Cincinnati Gilbert Machine Tool Co., Cincinnati 23, Ohio



Dividing Head Provides Wide Selection of Divisions

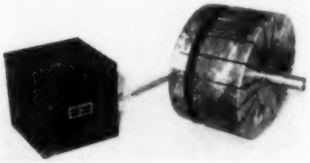
Said to be ideal for dividing operations required in gear cutting, layout, splines, fluting taps or reamers, cams, hex screws, and squaring shafts, this unit comes complete with three index plates, each having six sets of holes. It will tilt from 5° below horizontal axis to 30° past vertical. The unit is vertically adjustable for taper work. Head has 40:1 ratio. Tail center travel is 1 in. and the spindle nose has a No. 2 Morse-taper socket and 1 in.-10 threads. Complete head weighs 15 lb. Price is $99.50.

Marvin Machine Products Inc., 411 Ford Building, Detroit 26, Mich.

Infra-Red Heat Lamps Are Hermetically Sealed

Hermetically sealed and protected from dirt, dust, and fumes, 500-watt seal-beam industrial heat lamps incorporate tungsten filaments, especially constructed for infra-red use and pre-tested for twist and sag. The inside of the bulb is lined with pure, polished silver. Other Amplex heat lamps include sizes from 125 watts and up.

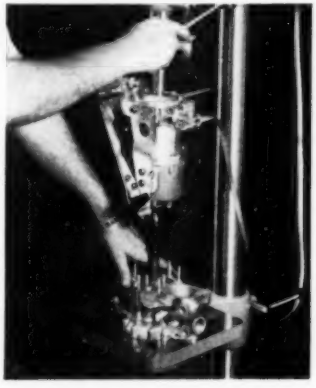
Amplex Corp., 111 Water St., Brooklyn, N.Y.



"Electrothrust" Power Unit Applies 6000-lb Force

Designed for applications similar to those of air and hydraulic cylinders the Electrothrust electric-power unit is capable of applying several tons force for operations requiring pressure, impact, or impact followed by pressure. Models are available with strokes from a fraction of an inch to several inches. Units can be mounted and operated from any ac lighting circuit. Model illustrated has 9-in. dia, is 5 in. long, and develops a maximum force of 6000 lb.

Black & Webster Inc., Needham Massachusetts.



Power-Driven Stud Driver Applies Predetermined Torque

Either right- or left-hand studs up to ½ in.-13 threads can be driven by this torque-indicating stud driver. The unit operates from any drill-press air motor or electric drill. Any torque desired can be maintained. A green light at the front of the driver glows until the predetermined torque has been attained. If the stud is driven too tightly a red light will glow. During the driving operation

a torque wrench indicates torque being used to drive the stud. A reversible clutch in the driver enables the conventional stop on the drill-press to be set to drive the stud to the correct height automatically. The stud driver can also be used for power tightening of capscrews and nuts to predetermined torques.

The Industrial Engineering Co., 730 E. Sample St., South Bend 18, Ind.

Combination Oil Cup Doubles as Oil Gage

Trico combination oil cups and oil gages replenish oil in bearings, transmissions, and crankshaft cases and also act as an oil gage for periodical oil-level checking. Shatterproof-plastic bottle keeps oil supply visible. All metal parts are heavily plated for corrosion resistance, and easy cleaning. The unit is equipped with a large sel-closing dust-proof filter cap and is available in 1-, 2-, 4- and 8-oz capacities.

Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis.

Safety Goggles Weigh Less Than 1 oz

For buffing, polishing, light assembly, and spot welding, the Coverlite goggle is available in clear, light green, or dark transparent frames. The injection-molded, non-flammable plastic frame is designed to permit comfortable wear over most types of personal glasses.

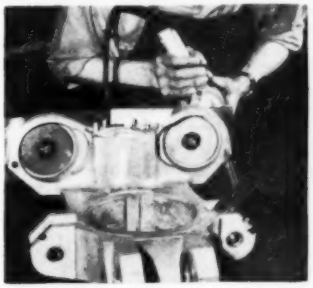
Chicago Eye-Shield Co., 2300 Warren Blvd., Chicago 12, Ill.

Diagonal Lapping Machine Employs Hardened Lap

Operating on the diagonal-lapping principle which usually requires only two passes and is faster than conventional lapping, the Red Wing diagonal lapping machine is reported to be capable of correcting gear errors of greater magnitude than conventional machines. Lap speeds and table feed are mechanically controlled and may be varied to meet any requirements. Gears can be lapped either diagonally or conventionally.

A hinged sub-worktable compensates for non-uniformity in gear size, facilitates loading, maintains any predetermined pressure between lap and work, and compensates for lap wear. Its action is air-operated and spring-loaded. At the end of the lapping circle the air cylinder unlocks the table and lowers it to facilitate unloading. A specially heated hardened lap is said to increase service life, adding economy to the operation.

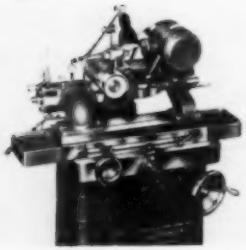
National Broach and Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.



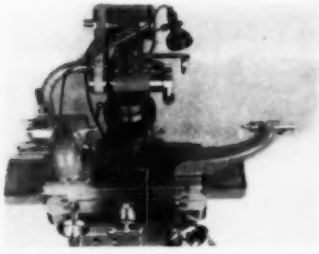
Temco Jig Facilitates Drilling of Half Holes

Formerly rasped out with a file, half holes can now be drilled by use of a special half-hole drilljig. Said to both reduce machining time 50% and to provide for cleaner and more uniform holes, this jig consists of a steel plate and block, attached with locating pins, to provide a two-point guide for the drill.

Texas Engineering and Mfg. Co. Inc., P. O. Box 6191, Dallas 2, Texas



All vital parts on the Jungner Type US-21 are ground to within 0.001 mm tolerance.



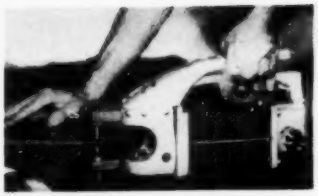
Extended tailstock is employed for grinding milling cutters on a long arbor.

Swedish Grinder Employs Countergrinding Principle

On the Jungner Type US-21 universal grinding machine, work is ground against the cutting edge. This countergrinding principle is said to avoid 1) drawing the temper, 2) wire edge, and 3) nicks on the cutting edge. It is also said to cut down on stock removal during sharpening. A combination of both rotary and traverse motion of the headstock provides a maximum working range. The clearance angle is directly set on a graduated disk on the dividing head, eliminating the need for tables or calculations. Tools may be clamped directly to the dividing head unless they are too long in which case the tailstock is used. The grinding head can be moved sideways and swivelled.

Worktable clamping surface is 98 x 450 mm, length of work table stroke is 210 mm, and traversing movement is 65 mm. External grinding speeds are 5000, 6900, and 8800 rpm. Internal grinding speeds, with special pulleys, are 13,400, and 18,300 rpm. Grinding-wheel motor is 3/5 hp, 3-phase, 220/380v, 50 cycles. Standard equipment includes dust exhauster, lighting, and dial-type pitch-indicating instrument.

Nife Incorporated, 165 Broadway, New York 6, N. Y.



Portable Spot Welder Joins ⅛-in. Steel

"Big Shot" is a 22-lb portable spot-welder which can be operated with only one hand. The 110-volt units weld two sheets of 20 to 18 gage steel, galvanized iron, Monel and Hoskins alloys, and stainless steel two gages thicker. 220-volt units weld up to ⅛-in. thickness. Equipped with a modulator for adjustment to varying power conditions, this welder is insulated to pass a test at 1600 volts. The upper tong of the Big Shot is fixed, while the lower tong moves. Tong specifications are 3½-in. reach, 5 in. overall; 6-in. reach, 7½ in. overall; and 12-in. reach, 13½ in. overall.

Tool and Equipment Distributors, 636 South 10th Ave., LaGrange, Ill.

Gas-Fired Forge Furnace Operates Continuously at 2200 F

Engineered for heavy-duty and continuous operation at 2200 F Eclipse furnaces are equipped with McKee Zero governors which give automatic control of the air-gas ratio throughout the entire range of the burner. Sillimanite tuyere burners are said to insure long block life and a minimum of slag. Low pressure gas, 3- to 10-in. W.C. and 16-oz air are used with standard fuel burners, but high pressure burners are also available. The operator is protected by a curtain of air which carries heat away from him behind a refractory lined heat shield.

Eclipse Fuel Engineering Co., Rockford, Ill.

Variable-Speed Drive For Small Conveyor Operation

Model 20 MT infinitely variable speed transmission will handle small conveyors usually driven with motors up to ¼ or 1/3 hp. The unit requires only four mounting screws and is complete with built-in motor, variable-speed drive, and built in two-stage spur gear reduction. Model 20MT is available with a large number of ratios of spur reduction delivering speeds from 110 to 0 rpm to 5 to 0 rpm. Micrometer speed control permits rapid speed adjustment to 1/400ths of the dial periphery. Drive can be furnished without motor if preferred.

Graham Transmissions, Inc., 375½ N. Holton St., Milwaukee 12, Wis.

Automatic Coil Cradles Feed Work at 90 ft per Min.

Developed to provide greater economy and increased efficiency in coil-stock punch-press operations, the Easy Load motor-driven automatic coil cradles are made in two sizes. The 300-lb model has a single-phase, ¼-hp motor and handles coil stock up to 36-in OD to 10-in. widths. The 330-lb model has a ½-hp motor and 40-in. OD coil stock capacity. Maximum speed rate of both is 90 ft per min. The smaller cradle is priced at $285 and the larger at $335.

Rowe Tool & Die Co., 1606 North Industrial Blvd., Dallas, Tex.

Cut YOUR COST PER PIECE WITH SHEFFIELD PRECISIONAIRES

and keep quality competitive

Precisionaires positively measure internal and external dimensions to the accuracy required on the production line, in the toolroom, or in the laboratory.

These trustworthy instruments for reliable dimensional control are universally used for cutting costs and protecting quality. They speed up inspection time and cut the cost of gages.

Scrap is reduced—more good parts are accepted—assembly time is cut—inspection costs go down—quality goes up.

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- Linear Column
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- Dual Control of Air Flow
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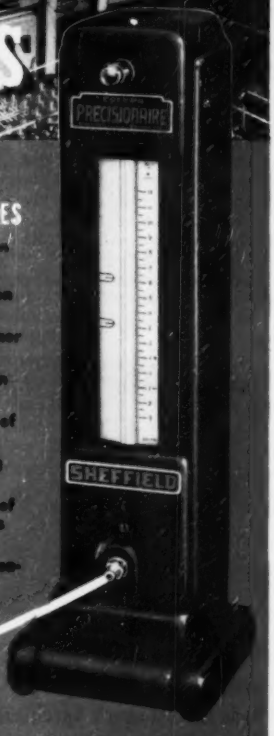
- Wider range of amplifications
- Broader field proven applications



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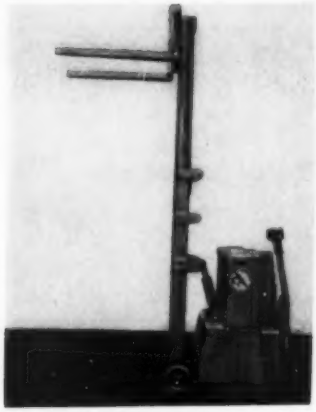
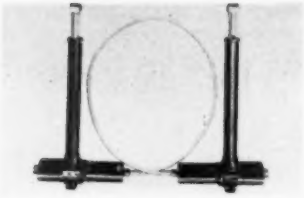


Walkie Electric Trucks Lift 1000-lb Load to 130 In.

For both horizontal and vertical movement of unit loads, this counterbalanced fork truck can handle loads up to 1000 lb and 48 in. long. It is made in telescopic and non-telescopic models with fork elevations up to 130 in., and is 46½ in. long, excluding forks. All controls are in the handle head.

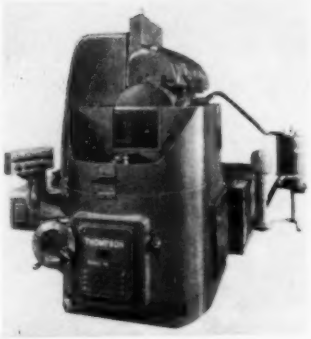
Lewis-Shepard Products, Inc., 265 Walnut St., Watertown, Mass.



Linear Thrust Generated by Electrically Powered Actuator

The "Lineator" is an electrically operated linear actuator or motorized screw jack for imparting straight line force in either tension or compression. It facilitates synchronization of pairs of units operating in unison regardless of load variations. The flexible shaft connecting the separate units handles only the differential power. Two or more units may be synchronized electrically in any desired relationship of motions. The Lineator is equipped with a magnetic brake to prevent coasting and to hold the load when "off," an externally adjustable stroke limit switch, and positive overtravel safety stops. It is powered by a 26-volt dc explosion-proof reversible motor.

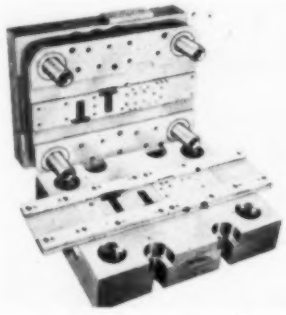
Airborne Accessories Corp., 25 Montgomery St., Hillside 5, N. J.



Truforming Contour Machine Cuts Grinding Time

Grinding time on 8-in. circular wood saws is said to be cut from 10 to 2½ minutes on the Thompson Truforming contour grinder. The grinding wheel covers the entire work area being shallow-tapered and both wheel and saw rotate in the grinding process. Grinders for circular wood saws are available in 6-to-12 and 6-to-16 in. sizes. Crushing, truing, and working cycles of operation are automatic with pushbutton control.

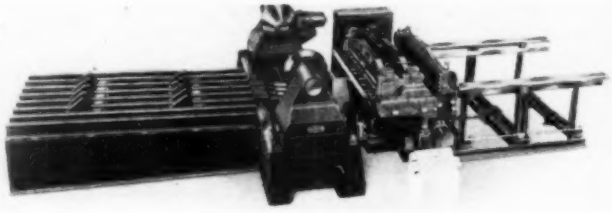
Thompson Grinder Company, Springfield, Ohio.



Carbide Lamination Dies Made to Customer's Specifications

Crescent carbide dies for manufacturers of electrical parts and precision stampings are made to customer's specifications, or designed from part prints if desired. Made of tungsten carbide, these dies are said to have life expectancy 20 to 60 times greater than that of steel dies. The die shown, for producing plunger laminations in 0.025-in.-thick steel, can be resharpened up to 300 times and produces an average of one million hits per sharpening.

The Crescent Tool and Die Co., 1714 Southfield Blvd. Lincoln Park 25, Mich.



Automatic Shear Operates At 60 Strokes Per Min

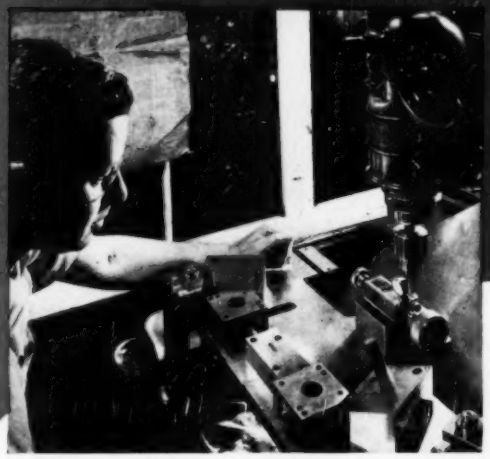
Cleveland automatic shear is equipped with loading table, automatic uncoiler, roll feed and stacker, all synchronized to operate as a combined unit. This single-geared unit has electrically-controlled air-operated jaw clutch and is designed to operate at a speed of 60 strokes per min. The loading table is arranged to accommodate two coils at a time placed behind two series of stops. Coils are released one at a time and are advanced by gravity feed over rubber-covered rails.

The automatic uncoiler is designed to accommodate coil stock from 12 to 96 in. wide, 72 in. OD, 16- to 30-in. ID and 20 tons in weight. The roll feed consists of five straightening and four feed rolls and is provided with backup rolls which act as stiffeners when wide material is being straightened. An oiling roller is also provided for coating the material with a protective covering. Variable-speed automatically controlled measuring device can be set for shearing material from 12 to 148 in. in length. Both sides of the stacker unit are adjustable by means of hand ratchets and may be set to correspond with the width of material being sheared.

The Cleveland Punch and Shear Works Co., Cleveland 14, Ohio

BTR

The versatile, safe-hardening tool steel



Long-wearing qualities and easy machinability are important considerations in this accurate locating gage made from BTR for an engine mounting yoke. Made by Lacey Manufacturing Co., Bridgeport, Conn.

This BTR forming die gives dependable service in the production of front wheel housings at the Metropolitan Body Company, Bridgeport, Conn. BTR is safe-hardening, holds accurate size.

1. **Safe** — *Oil-hardens at 1475 F*
2. **Accurate** — *Holds close dimensions in hardening*
3. **Long-Wearing** — *Good wear-resistance for long runs*
4. **Tough** — *Excellent shock-resisting properties*
5. **Easy-Machining** — *Anneals to less than 202 Brinell*

BTR is popular because it combines so many desirable qualities. It's versatile. Veteran toolmakers like it because it performs well in such a wide range of tools and dies.

BTR reduces cracking hazards, for it hardens at 1475 F ! . . it's easy to machine and heat-treat . . . it's tough, wear-resisting, deep-hardening . . . and it's a non-deforming steel you can depend on when extra accuracy is important.

Here's an economical grade that belongs in your toolroom. Use it as a general-purpose steel. You'll like the way it saves tooling time, reduces tool failure, prolongs production between grinds.

The nearest Bethlehem Tool Steel distributor or Bethlehem sales office can give you more complete details. Prompt deliveries from local stocks everywhere.

TYPICAL ANALYSIS:

C	Mn	W	Cr	V
0.90	1.20	0.50	0.50	0.20

HEAT-TREATMENT:

Anneal at 1450 F, furnace-cool, 202 Brinell
Harden at 1475 F, quench in oil
Temper from 325 to 400 F for a working hardness of 58 to 62, Rockwell C

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
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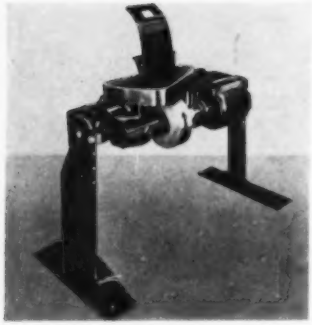
BETHLEHEM STEEL

Bethlehem SUPERSONIC TESTED **Tool Steel**



Automatic Scrap Choppers Handle Material Up to 6 in. Wide

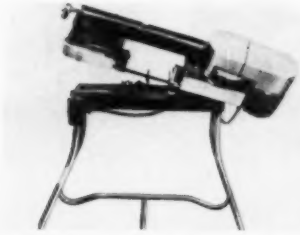
Durant Model 400 automatic scrap chopper is a heavy-duty machine for handling scrap material up to 6 in. wide and ¼ in. thick as it comes from the punch press. The chopper can be used with any power press and any type of automatic feed or hand feeding and is driven by a 220-440-v ¾-hp 3-phase motor. Only two bolts are required to set up this chopper. Three smaller size Durant scrap choppers are also available. Model 400, shown, is priced at $395.

Durant Tool Supply Co., 155 Orange St., Providence 3, R. I.

Hand Tapper Does Precision Small-Hole Tapping

Of square-socket-and-shank design, Model HT-250 is a bench machine for sensitive, precision, small hole tapping. Four collets handling standard tap-shank sizes from No. 0 to ¼ in., are supplied with the machine. Either right- or left-hand taps may be used. Maximum distance from machine base to bottom of tap is 6 in. Ball-and-spring tension against the spindle prevents it from falling.

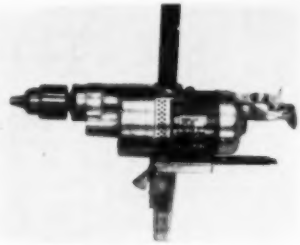
The H. D. Herder Tool Specialties Co., 2424 Brook Drive, Kalamazoo, Mich.



Metal-Cutting Band Saw Has Adjustable Blade Guides

Model 49A has a capacity of 3½ in. for rounds and 3½x6⅝ in. for rectangular shapes. The blade is driven by a 1/6-hp ball-bearing motor with manual start and automatic stops. V-belt drive provides selective speeds of 54, 100, and 190 fpm. The saw is also equipped with a quick-action vise and adjustable blade guides.

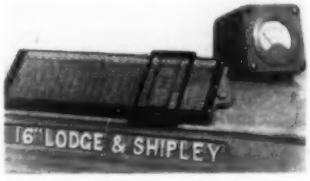
Wells Mfg. Corp., 505 Roosevelt Road, Three Rivers, Mich.



Two-Speed Electric Drill Cuts from ¼- to ⅝-in. Steel

The Pioneer drill can be shifted from high (880 rpm.) to neutral to low (460 rpm), while the motor is operating. Designed for either steel or hard wood, this unit can drill ¼- to ⅝-in. steel and ¼- to 1¼-in. hard wood. This model is powered with a Universal motor.

Louisville Electric Mfg. Co., Louisville, Ky.



L & S Lathes Equipped with Spindle-Speed Index Plates

Here's how the spindle-speed index plate works. The operator determines the most economical cut speed for the material and grade of tool used, moves the slider plate to that speed for the diameter being machined. He then reads the correct lever settings for spindle speed required and safe-horsepower cut that can be taken at the speed. If the lathe is equipped with an ammeter, calibrated to indicate horsepower consumption, depth of cut and/or feed can be increased up to the maximum the job will stand without fear of overloading the machine. The index can be used only on lathes with a multiplicity of spindle speeds in correct geometrical progression and capable of transmitting maximum horsepower at each speed.

The Lodge & Shipley Co., Cincinnati 25, Ohio

Fifth-Position Attachment Added To W&S Five-Spindle Automatics

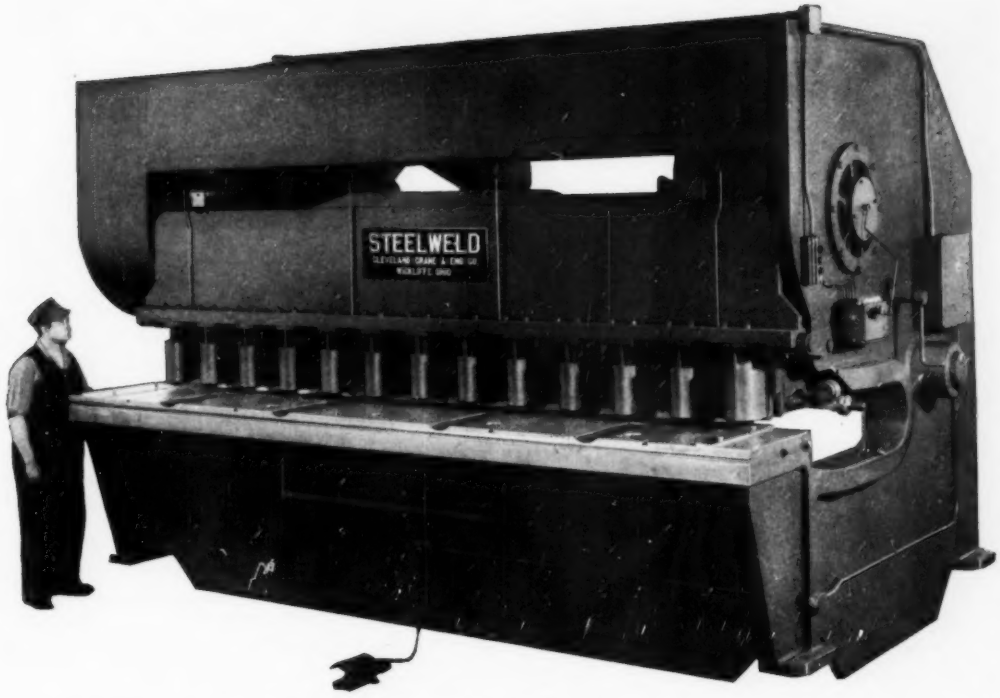
Independent attachment for Warner & Swasey five-spindle automatics permits a variety of cutting operations at the 5th longitudinal station during cutoff. It provides for drilling, reaming, facing, chamfering, counterboring, burring, and threading at a time when the 5th station is normally inactive. The attachment consists of a cam-operated actuating lever which drives a stroke arm linked to a toolholder. This toolholder is in turn mounted on a slide which is fixed to the main tool slide. The device provides an infinitely adjustable feed stroke in a 3/16- to 3¾-in. range within a total stroke of from 3 1/16 to 8¼ in.

The Warner & Swasey Co., 701 Carnegie Ave., Cleveland 3, Ohio.

Plastic Mixed, Extruded By Single Machine

The double-worm compounder-extruder mixes plasticizers, fillers, and stabilizers and then extrudes or palletizes the finished compound. Capacities in pounds per hour vary from 100 at 7½ hp to 1300 at 125 hp.

Welding Engineers, Inc., Norristown, Pennsylvania.



CUTS 12 FEET 3/4 INCH STEEL PLATE

at 30 Strokes Per Minute

SOME FEATURES OF THIS SHEAR

1. Cuts by pivoted-blade principle.
2. Operated by electric foot switch.
3. Knife clearance adjusted by hand crank and dial indicator.
4. 36-inch throat permits slitting wide plate.
5. Lift-up type back gauge on ball bearings.
6. Heavy all-welded one-piece steel frame.

This is one of a complete line of Steelweld Pivoted-Blade Shears that has been developed for cutting plate of all thicknesses from 12 gauge to 1¼-inch plate and for lengths from 6 feet to 18 feet.

Steelweld Shears are radically different from all other shears now on the market. They have features never before possible. The revolutionary pivoted-blade travels in a circular path and overcomes handicaps of ordinary guillotine-type shears.

Not only are these machines easier to operate but their design assures smooth straight cuts to hair-line accuracy for years of operation. Their construction is extra heavy, and all modern features are incorporated to provide for ease of operation, minimum maintenance and long life.

Get the facts on these outstanding machines.

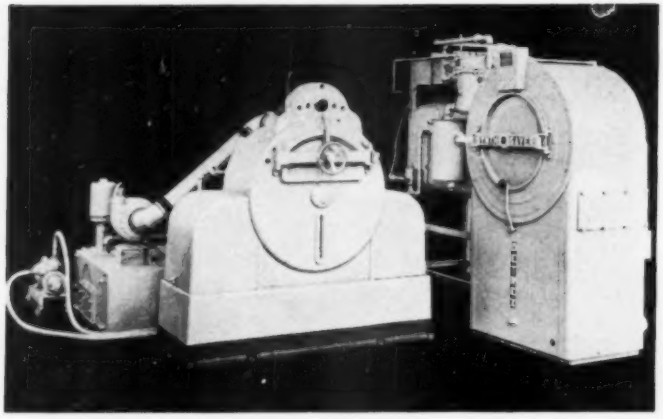
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1410 EAST 282nd STREET • WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS



Dry-Cleaning Units Designed For Industrial Application

Wiping rags and other shop garments get the full treatment in these Detrex industrial dry-cleaning units. With a capacity for 100 to 140 lb per hr, soiled weight, these units require 12 ft x 10 ft 6- in. floor space. Solvent capacity is 130 gal. and still capacity, 125 gal. per hr. Over-all electrical requirements are approximately 4 hp.

Detrex Corp., Box 501, Detroit 32, Mich.

Automatic Soldering Machine Uses Induction Heat

Work capacity of this soldering machine is aproximately 1000 pieces per hour depending upon the gage of the metal to be soldered and the area to be heated. The machine illustrated is soldering 3-in. paintbrush ferrules at a rate of 1200 per hour. Stainless-steel fingers push work along a V track which passes over an induction-heating coil to melt the solder. Then the track passes through a shallow water trough to set the solder before work drops through exit hole at right edge of the worktable. The soldering heat is supplied by a 1-kw induction heater. Work pieces from ½ to 5 in. long are accommodated in the machine shown.

Sherman Industrial Electronics Co., 505 Washington Ave., Belleville 9, N.J.

Verson Power Press Brake Has 48-in. Bed Length

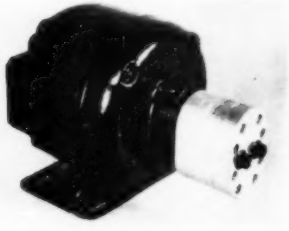
Suitable for most metal forming ordinarily performed on press brakes, the Verson 16-48 air-bending capacity is rated from a 48-in. length of 16-gage stock over a ½-in. opening to a 24-in. length of 10-gage stock over 1⅛-in. opening. A variable-speed arrangement provides 20 to 50 strokes-per-min. operation. Totally inclosed friction clutch and self-releasing band brake are employed and alemite hand fittings are provided for convenient lubrication.

Verson All-Steel Press Co., 9316 S. Kenwood Ave., Chicago 19, Ill.

Portable Ultrasonic Instrument Tests Metals for Defects

An improved pattern of square-wave "inch markers" on the horizontal axis of the screen of the type-UR Style-50E351 Reflectoscope facilitates interpretation of test results. A reject control eliminates indications of small defects which do not affect the performance of the material under text. By means of ultrasonic vibrations this tester accurately locates the position of defects in the material in relation to the surface. Steel billings, forgings, castings, finished stock, and a wide variety of machine parts can be tested on the reflectoscope.

Sperry Products Inc., Danbury, Conn.



Positive-Pressure Pump For Quick Oil Changing

Model 1304 is a gear pump equipped with an aluminum body, bronze gears, cup seal, and is closely coupled to a ¼-hp, 1725-rpm, split-phase electric motor. It pumps 1½ gpm at 200 psi.

Eastern Industries, Inc., 296 Elm St., New Haven 6, Conn.

Lundberg Screw Products Co. makes *better* studs *at lower cost* with J&L ELECTREAT COLD-FINISHED STEEL BARS

J&L STEEL

Cutting precision threads on J&L Electreat Steel with a two-spindle threader at Lundberg Screw Products Co., Lansing, Mich.

Steel costs are reduced 20% to 30% . . .
Heat treating of finished studs is eliminated.

Steel studs made by Lundberg for such equipment as truck axles, farm implements and diesel locomotives, must be made to exact specifications.

By using J&L *Electreat* cold-finished bars to replace higher-cost alloys, such as chrome-molybdenum and chrome-nickel-molybdenum, Lundberg not only meets the customer's specifications but also obtains *two savings: Steel costs are reduced*, and *the nuisance and expense of heat treating is eliminated.*

In addition—finished studs are of better quality. They are free from scale and distortion caused by "batch" heat treating. They have clean, sharp threads. Inspection rejects are reduced.

Each bar of J&L *Electreat* cold-finished steel is individually heat treated at the mill by the electric-induction process under exacting control. The flexibility of heat control in the Electreat process permits "tailor-made" combinations of surface and core properties to fit *your* requirements.

Many fabricators of gears, couplings, bolts, nuts, shafts and other steel parts take advantage of these money-saving qualities of J&L *Electreat*. The booklet, "*New* J&L *Electreat* Heat-Treated, Cold-Finished Steel," compares the properties obtained by the Electreat process with conventional "batch" heat-treatment and points the way to greater profits. Let us send you a copy.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Pennsylvania

Please send me a copy of "*New* J&L *Electreat* Heat-Treated, Cold-Finished Steel."

Do you recommend Electreat for:

_____

NAME _____

COMPANY NAME _____

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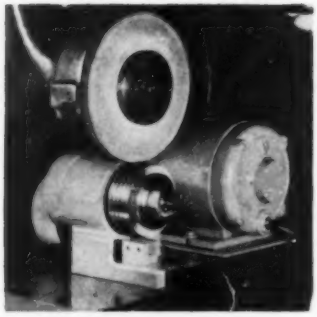
JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY (*hi-tensile steels*).

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS



Portable Wheel-Crusher Unit Grinds Wheels to 1¼-in. Width

Portable wheel-crushing unit is for crush forming grinding wheels. The standard unit is for grinding wheels up to 1¼ in. in width. Wider wheels can be formed by the addition of longer roll spindles. A universal crusher roll of hardened steel with a series of grooves in the periphery for mounting wires of different dimensions or shapes, has been developed along with the portable wheel-crusher fixture. One 1¼-in.-wide roll, for radii forming, will develop a half spherical radius from 0.001 to 0.0625 in. when the correct size wire is inserted in the roll groove. The roll arbor is mounted with heavy-duty precision Timken roller bearings and is equipped with a ⅛-hp 115-v 60-cycle single-phase motor complete with toggle switch and an 8-ft extension cord and plug.

The Jerpbak-Bayless Co., Inc., Chagrin Falls, Ohio.

Miniature Thermostat Provides High Sensitivity from 0 to 400 F

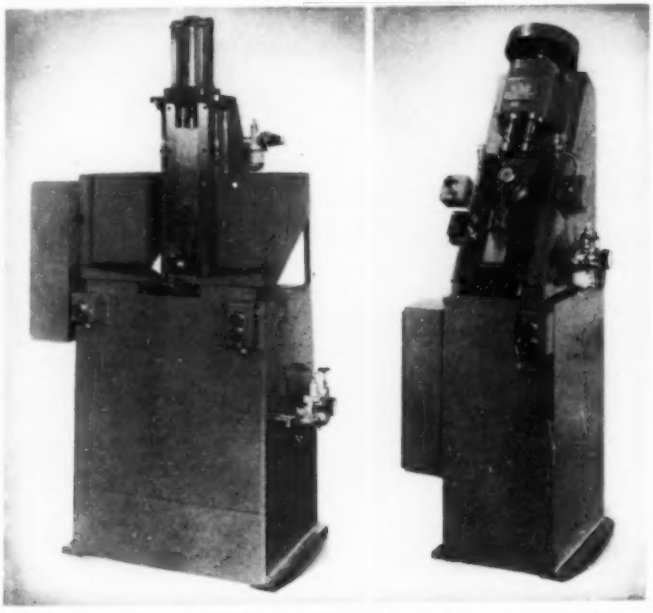
Measuring 1x5/16x¼ in., this totally enclosed thermostat has an electrical capacity of 100 watts ac at 115 volts. It can be furnished with normally-opened or normally-closed electrolytic-silver contacts. Extremely sensitive adjustments from 0 to 400° F are made by a single adjusting screw. It has wire-clinch terminal lugs.

George Ulanet Co., 410 Market St., Newark 5, N. J.

Unique Power Transmission Produces Interrupted Rotation

The Augur Movement is a power transmission that converts and reduces constant-speed input to a quick-reversing action that interrupts the rotation of the output shaft every 45° of travel. Originally designed to perform honing and lapping operations, the unit is now recommended for solution agitation, or for power transmission for buffing and polishing, pipe-threading, valve grinding, and floor-sanding machines. The Augur Movement can operate at any specified speed from any rotary power source.

Metal Seal & Products, Inc., 21807 St. Clair Ave., Euclid 17, Ohio.



CONNECTING ROD ASSEMBLY and disassembly machines are made by the Trio Tool Co., of Detroit. In the assembly machine (right) connecting-rod bolts and nuts, carried in right and left hoppers, are assembled with the connecting rod and cap. The units can be adjusted to automatically tighten the nuts to within ± 3 in. lb of torque. Disassembly machine (left) loosens nuts so that they can be removed by hand. Caps are pulled loose from the rods as the assembly descends to the unloading position in the machine—*Trio Tool Co., Detroit, Mich.*

Carbide-Tipped Roughing Blade Expands Up to 4 in.

Carbide-tipped roughing blades for boring bars expand up to 4 in. Ruggedly built, for heavy cuts, the rougher provides extra support for carbide tips. It is expanded by loosening the set screw. The lock-screw slide holds it in fixed position.

Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.

IF YOU ARE INTERESTED IN *Efficient* BROACHING PRODUCTION

Here is the complete broach service that guarantees you'll get it!

PLANNING

Detroit Broach aids in selecting your machines or adapting them . . . supplies complete cost and production data.

ENGINEERING

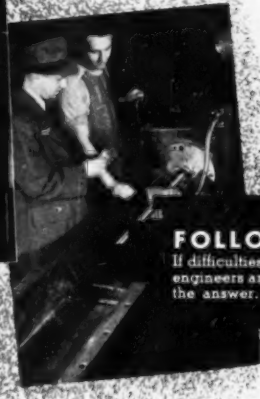
Tooling is designed by men who specialize in broach tooling only . . . men who know broaching technique.

MANUFACTURING

Tooling is produced on equipment selected specifically for the manufacture of broach tooling . . . in a plant producing nothing else.

SET-UP & TRY-OUT

Your machine set up and tried out at Detroit Branch . . . delivered to you *ready to go.*



FOLLOW-THRU

If difficulties later occur, field engineers are on the spot with the answer.

and it's handy, too!

Wherever you are, there is a Detroit Broach representative in your locality to give prompt service. Our application engineers are at your disposal, too. They'll gladly give you actual cost and production data for your jobs. Call or write today . . . it may be the first step toward worthwhile production savings for you.

DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
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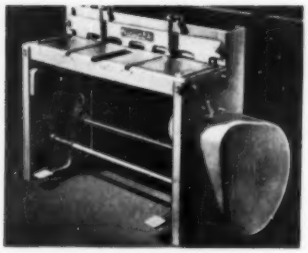


High-Speed Power Shears For Light-Gage Sheet Metal

Niagara Power Shears can operate continuously at 125 strokes per min on mild steel up to 20 gage. Arched openings provide full visibilty of the cutting edge. Housings, bed, holddown, and crosshead are fabricated from electrically welded steel plates for greater strength and rigidity and reduced weight. Bronze bearings and ways are provided. Axial air-gap motor drives the unit.

Niagara Machine and Tool Works, 637-697 Northland Ave., Buffalo 11, N.Y.

Die Casting Lubricant Applied wth Brush, Spray

Die Slick No. 9, for pressure die casting dies, is reported to prevent scoring and sticking and to enable easy ejection of castings from the die. Applied with brush or spray the compound leaves no carbon, gum, or other residue in the die. Packed in 1- and 5-gal. cans and 55-gal. drums, Die Slick No. 9 is non-toxic and causes no objectionable fumes or smoke.

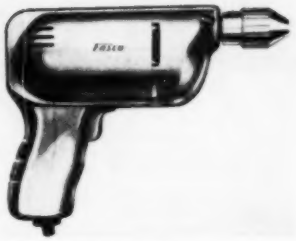
G. W. Smith & Sons, Inc., 5400 Kemp Road, Dayton 3, Ohio.

Pease Whiteprinting Machine Is Completely Automatic

Ammonia-vapor whiteprints are developed continuously in cut sheets or from rolls at speeds ranging to 32 fpm in the Pease Pacemaker. Completely automatic, this machine reproduces tracings, drawings, foil, film, or anything typed, written or drawn on reasonably translucent paper. All types and sizes of diazo materials up to 42-in. width are handled. A pushbutton master switch controls all electric motors and heaters, instantaneously starting or stopping the entire mechanism. Automatic signal lights indicate various conditions in the functioning of the machine during the operation period.

Exposed prints are automatically conveyed into the developer while original copy is returned to the operator. A paper-cutting device for roll stock is included. The Pacemaker operates on 200- to 250-volt, 60-cycle single-phase ac with starting current of 32 amps and running current of 48 amps.

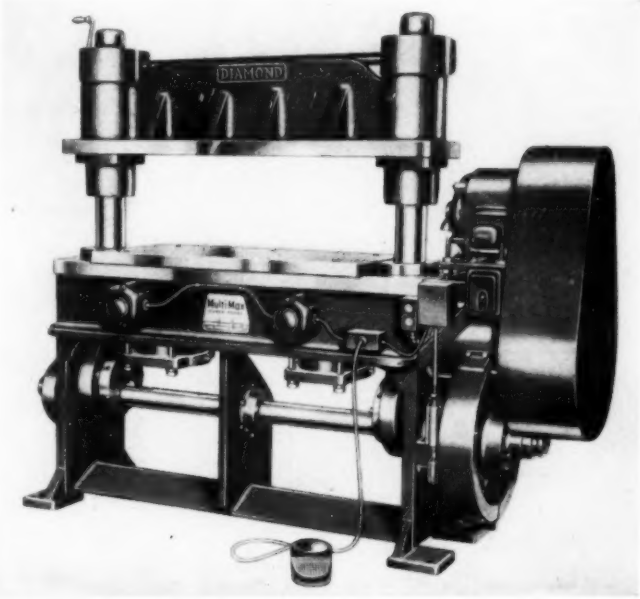
The C. F. Pease Co., Chicago, Ill.



Fasco Electric Drill Bores ¼-in. Steel

Operating on 110-120 volts, ac or dc this Fasco portable electric unit drills up to ¼-in. steel and ½-in. wood. It has 1600 rpm no-load speed and is equipped with an 8-ft cord. The trigger switch can be locked for continuous drilling. The drill weighs 3½ lb.

Fasco Industries, Inc., Rochester, N. Y.



30-Ton Diamond Punch Press Has 16x36-in. Bolster Area

The Diamond Model 3936 is a double-crank punch press of 30-ton capacity. Bolster area is 16x36 in. and the ram area is 10x36 in. Standard stroke is 2 in., maximum stroke to order is 4 in., and press speed is 80 strokes per min. The press is single geared with precision herringbone-gear design and is equipped with two 8-in. pneumatic-draw die cushions and an electrically operated solenoid clutch mechanism with dual push-button safety switches and remote-control foot switch. Motor required is 3 hp., 1800 rpm. standard shut die height is 10 in.

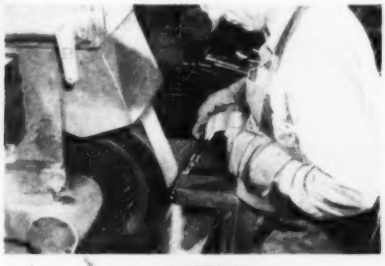
Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif

Schwinn Saves $42,000!

Finishing costs cut 50% on just one of several belt grinding operations

Finishing costs on bicycle crank forgings dropped from 14¢ to 7¢ per unit when Arnold Schwinn & Co., America's largest bicycle manufacturer, converted to belt grinding. 3M Abrasive Belts give faster rough cutting, finer finishing, save $42,000 a year on this one operation alone.

3M Methods Engineers are trained to analyze your production problems in rough grinding or finishing of metals, wood, glass, or plastic. They can show *you* savings . . . increase the quality of your workmanship. Write today for complete information.



WORLD-FAMOUS SCHWINN-BUILT BIKES are known for high-quality workmanship. 3M Abrasive Belts give superior finish to frame members, other internal parts.

GROOVED BUFF CONTACT WHEEL permits easy polishing of contours on tough crank forgings. 3M Abrasive Belts give smoother finish in half the time of former methods.

MAIL COUPON FOR FREE BOOKLET full of money-saving shortcuts for your grinding and finishing operations.

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☐ Please send me a copy of your "Step Up Production" booklet.

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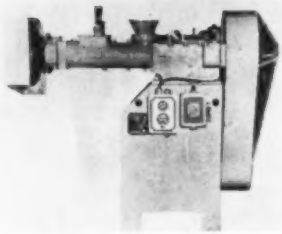
3M® ABRASIVE BELTS

Made in U.S.A. by **MINNESOTA MINING & MFG. CO.** St. Paul 6, Minn.
Also makers of "Scotch" Brand pressure-sensitive tapes, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives

General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.* • *In Canada:* CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*



Plastic Mix Extruded By Single Machine

The double-worm Compounder-Extruder mixes plasticizers, fillers, and stabilizers and then extrudes or palletizes the finished compound. Capacities in pounds per hour vary from 100 at 7½ hp to 1300 at 125 hp.

Welding Engineers, Inc., Norristown, Pennsylvania.

Vertical Milling Unit Attaches to 9- or 10-in. Lathes

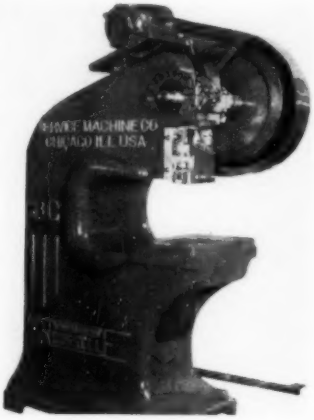
Driven by the lathe head this vertical milling attachment can be adapted to any 9- or 10-in. lathe. A draw tube for standard collets is provided for holding straight-shank cutters. Speed of the vertical spindle is double that of the lathe. Work is held in a swivel vise, mounted on top of the lathe cross-slide. Maximum clearance under the spindle of the 9-in. lathe is 3½ in. Horizontal travel of the vise is 5 x 6 in. and vertical spindle travel is 2 in.

C. G. Forsman Co., Metal Specialties, 714 Elliott St. S.E., Grand Rapids 7, Mich.

Micrometer Amplifies Thickness Readings

The Krouse Magnifying Micrometer is a precision pocket tool for measuring thickness of plating, paint, and enamel. The difference in average instrument readings for a 0.001-in. plating thickness on steel is about 60 div. The micrometer measures the force necessary to overcome magnetic attraction between the precision-formed permanent magnet in the instrument and the magnetic base material, magnetic coating, or their combination. Turning the micrometer thimble changes the tension on the precision spring. When this tension is larger than the force holding the magnet to the surface being tested, the magnet will separate from the surface, moving the indicator rod which extends above the top of the tool. The gage will determine coating thickness within less than 10% error, when certain limitations are recognized. Roughness of the steel base surface causes erratic readings when the coating is less than 0.001 in. thick. A number of readings to obtain a fair average is recommended.

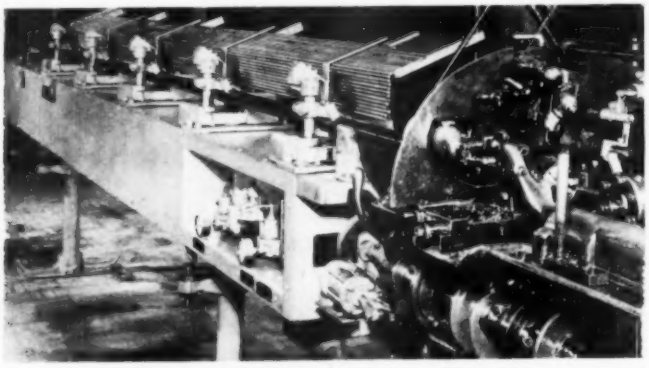
Krouse Testing Machine Co., 573 E. 11th Ave., Columbus 3, Ohio.



Deep-Throat Press Permits Work to Center of 36-in. Sheets

Twenty-five ton Rousselle deep-throat press No. 3-G has an 18-in. throat permitting work to the center of 36-in. sheets. It is equipped with a single-stroke or continuous clutch, roller bearing flywheel, extra long hardened-and-ground ways, and the standard bolster plate measures 14 x 20 in. Larger bolsters and punch holders can be furnished. The press operates at 125 rpm and weighs approximately 3200 lb.

Service Machine Co., 7627-33 S. Ashland Ave., Chicago 20, Ill.



LIPE AUTOMATIC MAGAZINE-LOADING pneumatic bar-feed unit can feed from 0- to 16-in. lengths of stock ranging in diameter from ⅛ to ⅝ in. Magazine capacity is 19⅝-in. bars and up to 96⅛-in. bars. Time per one feed-out or collet opening is 0.2 to 0.5 sec. Restocking time replacing bar in spindle is only 4 sec. The feeder can be installed in 6 to 8 hr. These units are said to increase screw machine output 60% or more —*Lipe-Rollway Corp., Syracuse 1, N.Y.*

Cemented-Carbide Tips Finish 2000 Pieces Per Grind

No. 905 grade Carboloy cemented carbide is for finishing and light roughing cuts on non-ferrous metals and cast irons with hardness up to Brinell 550. Higher hardness, more wear resistance, greater cutting-edge strength, greater resistance, and more rapid dissipation of heat at the cutting edge are claimed by manufacturers. Tools tipped with the No. 905 are finishing 2000 pieces per grind.

Carboloy Co., Inc., Detroit 32, Mich.

3 MINUTES = UP TO 10 × > CONVENTIONAL

with the New Monarch Air-Gage Tracer Packaged Unit

WHAT THE AIR-GAGE TRACER PACKAGED UNIT DOES

- Permits conversion of a Monarch Engine Lathe into a fully automatic cycle machine in 3 minutes—or less.
- Combines the power and flexibility of a fast, modern engine lathe with automatic template control of size and shape.
- Requires operator only for loading, unloading and pressing cycle start button, thus permitting one operator to handle two machines—easily.
- Because of individual motor-driven feed, it permits selection of the exact feed for top cutting tool efficiency on every job.
- Permits return to conventional operation in less than one half minute.
- Increases production up to 10 times, yet provides flexibility of operation —with a minimum investment in equipment.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

Mathematically speaking, that isn't a perfect equation. But the story it tells *is* perfect—as an answer to rising production costs in metal turning.

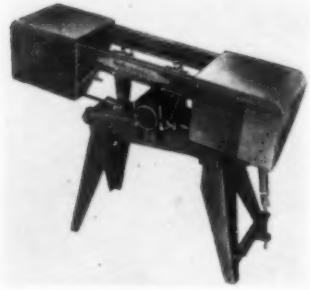
What that equation says is that the new Monarch Air-Gage Tracer Packaged Unit, which can change a standard Monarch production lathe from manual to automatic operation in three minutes, will increase production as much as ten times over conventional methods.

This new Packaged Unit, applicable as factory equipment on standard Monarch Engine Lathes, combines the time-saving, cost-cutting advantages of the Air-Gage Tracer with a variable feed and rapid-traverse return, making a completely-automatic cycle lathe. The result is a precision machine that provides maximum production on single pieces or large-lot runs—at a reasonable initial investment cost.

If your production includes multiple-diameter shafts, or the turning, boring or facing of contours, it will pay you to investigate the savings made possible by Air-Gage Tracer Packaged Unit Operation. Get the full facts *now*. Ask for bulletin 2604.

THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

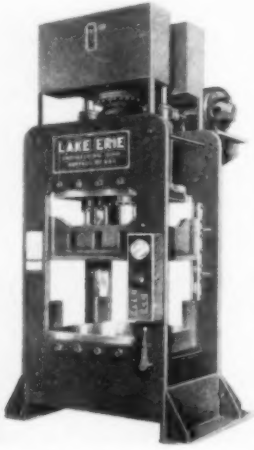
FOR A GOOD TURN *FASTER* — TURN TO MONARCH



Portable Bandsaw Cuts 6x10-in. Metal Bars

Equipped with a hydraulic dash-pot mechanism to insure controlled constant pressure from beginning to end of cut the No. 610-S portable cutting band saw cuts angle bars, tubes, and pipes up to a capacity of 6x10 in. Four cutting speeds range from 53 to 266 fpm. The unit is powered by 1/3 hp motor, has double sets of blade-cleaning brushes and weighs 198 lb.

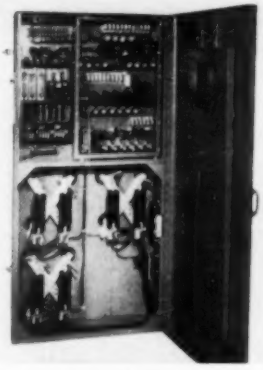
Kalamazoo Tank & Silo Co., 560-508 Harrison St., Kalamazoo, Mich.



Metal-Forming Presses of Single-Action Design

Series DF presses are available in 100-, 150-, and 200-ton capacities. The basic unit in each size is a single-action, downstroke, front and back plate, gib-guided press with hand-lever control. Each size unit can be obtained with hydro-pneumatic die cushion and each can be ordered with larger pumping units giving correspondingly higher speeds and complete pushbutton control. Platens for the three models are 28 in. square, 36 in. square and 48 in. square and strokes are 16, 22 and 28 in. respectively.

Lake Erie Engineering Corp., Buffalo 17, N. Y.

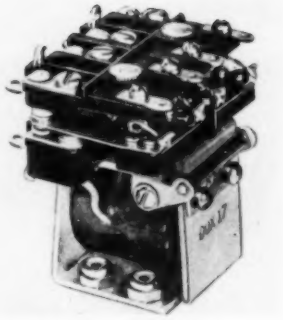


Welding Control Converts 3-Phase to Single-Phase Power

Westinghouse three-phase low-frequency welding control draws power from a 3-phase line and converts it to a lower frequency, single-phase for resistance welder electrodes. Total power demand is spread over all phases of any standard three-phase, 60-cycle, 220-, 440- or 550-volt primary power source. Control panel can be mounted on the floor or on the side of the machine.

Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

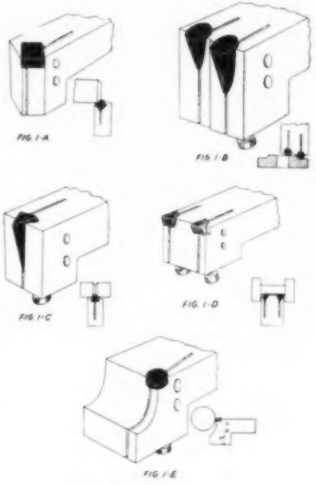
ELECTRIC FORK TRUCKS in special short-turn models are of 2000, 4000, and 7000 lb capacity. Redesign of battery compartments and counterweights reduced the turning radius of the 2000-lb Clipper by 6½ in. the 4000-lb Carloader by 6¼ in.; and the 7000-lb Utilitruc by 6 in. Standard models remain unchanged. Machines are available for export sale.—*Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.*



Power Relays Mounted on Molded Phenolic Panels

Type "DO" power relays are available in contact combinations up to 4-pole, double-throw. These units are 2¼ in. high, 2 1/16 in. wide and 1⅞ in. deep. Coils can be obtained for continuous duty for operations up to 230 volts ac at 60 cycles, or 115 volts dc.

American Relay & Controls, Inc., 4925 W. Flournoy St., Chicago 44, Ill.

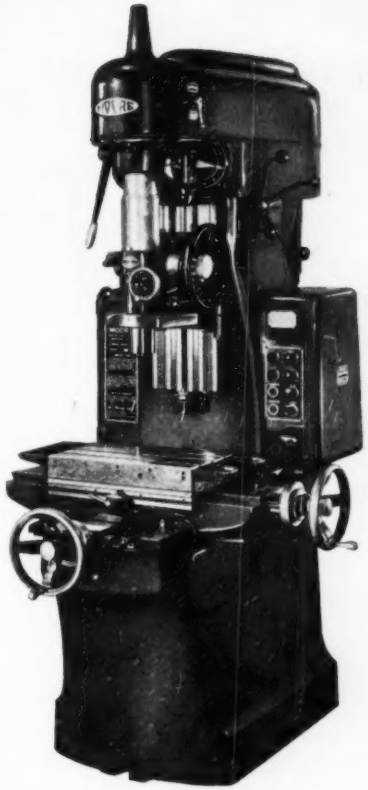


Special Holders Are for Carbide-Insert Tools

For use where it is desired to incorporate special angles, Carboloy has developed special holders for insert tools. Fig. 1-A shows special tool holder made for chamfering. Fig. 1-B shows holder useful in step turning or where it is desirable that one insert act as a rough tool and the other as a finisher. Fig. 1-C, 1-D and 1-E are other special available holders.

MOORE Creates

ANOTHER Great Jig Borer



You purchased 1,000 Moore Jig Borers during the last 15 years. So outstanding is their performance record that impartial judges call the Moore Jig Borer "the best machine tool for the money built in the United States."

In answer to popular demand, Moore now consolidates this extensive experience into a larger model and incorporates into it the ultimate in jig borer construction. The new No. 2 model extends the exclusive Moore principle of accurate lead screws, assuring precise, rapid table settings within .0001" by coordinate location, and adds numerous significant features, including:

1. **Increased capacity and size** – heavier cuts, larger holes—up to 5" in mild steel or cast-iron.
2. **Infinitely variable spindle speeds,** push-button controlled: range from 90 to 2400 RPM.
3. **Three power feed ratios,** .0015", .003", and .006", per revolution of spindle in either direction.
4. **Centralized control panel** (and tachometer) for spindle speeds and one-shot lubrication.
5. **Disconnect clutch** for easy indicating.
6. **Satin chrome finish** on all dials and handwheels eliminates glare and rust.
7. **Trip mechanism** prevents jamming of lead screw nuts through over-travel.
8. **Totally enclosed drive mechanism** – no open belts or sheaves.

Moore No. 2 Jig Borer Specifications

Table working surface	10" x 19"	Vertical adj. quill housing	10"
Table travel longitudinal	16½"	Spindle quill travel	5"
Table travel crosswise	10½"	Spindle center to column ways	10"
Table top to spindle end	min. 3" max. 18"	Spindle cen. to col. below ways	11½"

Send for descriptive literature.

HAVE YOU BOUGHT YOUR COPY OF "PRECISION HOLE LOCATION"?

Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3. 448 pages, over 400 illustrations, 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

MOORE'S Famous No. 1 Model Remains in the Line

For its range—table working surface of 10" x 16" and cuts up to 3½"—this machine with 1,000 satisfied users is still an ideal buy and will be continued to be offered for the many situations where a small, accurate jig borer fills the required prescription.

MOORE SPECIAL TOOL CO., INC.
738 UNION AVE., BRIDGEPORT 7, CONN.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

FROM
25-125
erratic threaded holes
per tap

TO
22,000
clean class 3 threaded
holes per tap

HERE'S HOW
HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

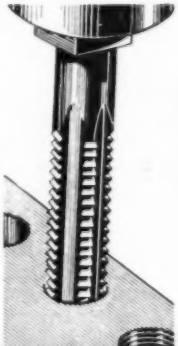
PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

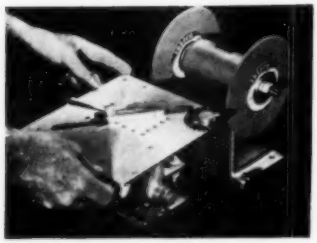
These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

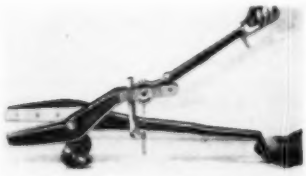
HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY



Sharpening Fixture Handles 1½ to 12-in. Dia Circular Saws

With an 8-in. square table top which may be tilted and set up to 80° to either side, the Model 135 all-purpose sharpening fixture is for sharpening carbide-tipped tools, cutters, and all types of circular saws from 1½ to 12 in. in diameter. An adjustable stop limits the amount of swivel to the grinding wheel. The unit sells for $29.95, including a 12-in. saw set and index for the table top.

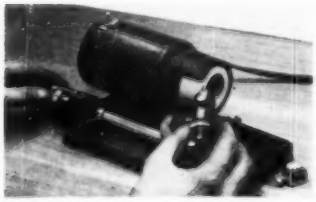
Treyco Products, Buffalo 17, N. Y.



Shears with Compound Leverage Cut Heavy Sheet Metals

Heavy-duty Super-Shears cut steel sheets, rods, and bar stock up to ⅛-in. thickness and thicker sections of non-ferrous metals. Over-all length of the tool is 36 in., length of blade is 9 in., and weight is 27 lb.

Super Manufacturing Corp., Dept. 28, Chicago 24, Ill.



Green Grinder Sharpens Small Engraving Cutters

Equipped with an ac-dc preload ball-bearing motor delivering 1/10 hp, this grinder is for sharpening small engraving cutters. Standard cutter head is for Green Instrument Co. tapered shank engraver cutters, but

NEW SQUARE D "PLUG-IN" CONTROL CENTERS

above
• Size 2 plug-in starter unit

right
• Disconnect operator handle

NOW ... *take full advantage of Control Center convenience, safety and economy . . . Square D "PLUG-IN" centers are new from the ground up, with all basic features plus . . .*

NEW INSTALLATION ECONOMY. Wiring channels are all accessible from front without removing units. Two big vertical channels per section permit separation of power and control circuits.

NEW SPACE ECONOMY. Up to six starters fit in 20" x 20" x 90" sections. Standard 20" depth sections will accommodate starters through size 5.

NEW SAFETY DISCONNECT OPERATOR. One to four padlocks will lock both door and disconnect in either "ON" or "OFF" position. On closing unit door, handle moves to indicate position of disconnect. When not padlocked, authorized person with tool can release door interlock to inspect control without interrupting power.

NEW FLEXIBILITY. For simplest plant conversion or maintenance, plug-in units slide on guide brackets and positive pressure stabs grip round vertical busses. Plant conversion is simplified and minor changes often will not require shutting off power.

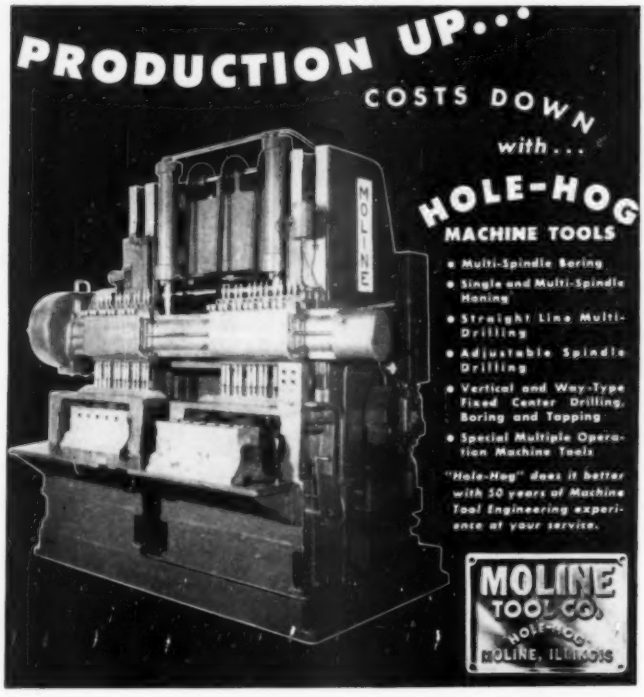
Square D's NEW Control Centers are also available in dust-tight and weather-resistant enclosures. Contact your nearby Square D Field Engineer for complete information, or

Write **Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin**

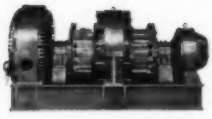
SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



What makes H-VW-M low voltage GENERATORS so efficient...?



P. R. LYONS
Manager of Electrical Sales
H-VW-M COMPANY

Trouble-free commutation is achieved in H-VW-M low-voltage generators by such outstanding features as fully-insulated brush holders and rigging... use of copper pig-tail bars eliminates current passage through springs and fingers which in turn considerably increases brush life... one piece brass casting for correct brush box alignment... radial adjusted brush holders and rigging to provide firm and permanently correct positioning of the brushes.

H-VW-M generator brushes are made of special copper graphite, constructed to insure highest conductivity along the path of the current. Moulded-in "equaload" shunts distribute brush load equally.

To these construction features are added such refinements as fan action of commutator risers to increase ventilation of field and rotor coils... rolled steel ring set within frame to lower center of gravity... liberal size, sleeve-type bearing to insure quiet, trouble-free life.

For increased efficiency and low cost power production investigate H-VW-M motor generator sets. You'll find the complete story in Bulletin G-102—yours for the asking.

SINCE 1920

Hanson-Van Winkle-Munning has supplied the plating industry for over 70 years. Our sales-engineers are thoroughly familiar with every step in the process of electroplating and polishing. It is this overall knowledge that has made H-VW-M "Headquarters" for electroplating and polishing equipment, supplies and technical assistance.

HANSON-VAN WINKLE-MUNNING COMPANY
MATAWAN, NEW JERSEY
Manufacturers of a complete line of electroplating and polishing equipment and supplies
Plants: Matawan, New Jersey - Anderson, Indiana
Sales Offices: Anderson - Chicago - Cleveland - Dayton - Detroit
Grand Rapids - Matawan - Milwaukee - New Haven - New York - Philadelphia
Pittsburgh - Rochester - Springfield (Mass.) - Stratford (Conn.) - Utica

7351

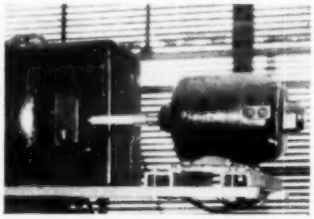
can be supplied in other tapers with collets for handling straight shank cutters. Hand-operated infeed is graduated in 0.001. A buffing wheel may be attached to the unit without disturbing the grinding wheel. Complete grinder sells for $85 FOB Cambridge.

Green Instruments Co., 385 Putnam Ave., Cambridge, Mass.

Solenoid-Controlled Valve Is 4-Way Pilot-Operated Unit

Model 1044 is a fast-acting, tight-seating valve for handling air, water, and light oils. It may be operated continuously at cycling speeds up to 600 cycles per min and has been run as high as 1800 cycles per minute. It is available for operation at line pressures from 0 to 50 psi or from 30 to 150 psi. Bodies are cast bronze, full ported, with screwed pipe connections tapped ¼, ⅜, ½, or ¾ in. IPS. The main valve seats are of special composition rubber, molded to brass inserts.

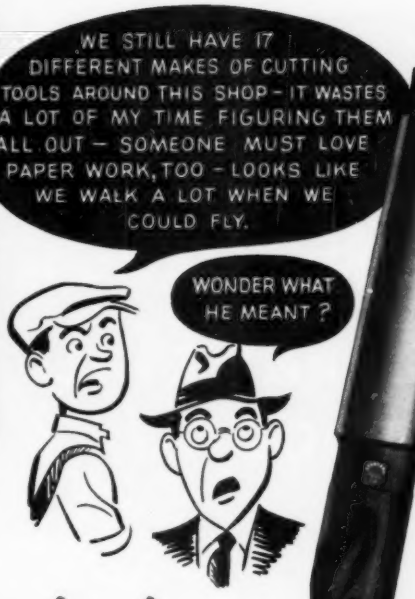
Crescent Valve Co., 6073 State St., Huntington Park, Calif.



G.E. Tachometer Generator For Heavy-Duty Work

Totally inclosed and equipped with rubber-mounted ball bearings and an alnico permanent-magnet field, this dc tachometer generator is designed for heavy duty. End play has been pre-loaded to 100 lb to counteract the end thrust of large machines. The generator is available in three models ranging in speed from 100 to 1450, 100 to 2500, and 100 to 5000 rpm.

General Electric, Schenectady 5, New York.


WE STILL HAVE 17 DIFFERENT MAKES OF CUTTING TOOLS AROUND THIS SHOP – IT WASTES A LOT OF MY TIME FIGURING THEM ALL OUT – SOMEONE MUST LOVE PAPER WORK, TOO – LOOKS LIKE WE WALK A LOT WHEN WE COULD FLY.
WONDER WHAT HE MEANT ?

Time is saved when you *Standardize*

1. In requisitioning
2. In purchasing
3. In stock keeping
4. In the tool crib
5. In tooling up

THE Standard Shield Brand line is complete. Standard Shield Brand Tools are specified and used by every mass production industry. Standard Shield Brand Tools are Foremost Quality—in design—material—workmanship.

More than 10,000 items are regularly carried in stock. Standard men have the accumulated experience gained by 68 years of successful experience in solving tough problems.

These tools are distributed coast to coast by leading Mill Supply Distributors.

Standardize! Why walk when you can fly?

STANDARD TOOL CO.

Successor to The Standard Tool Company

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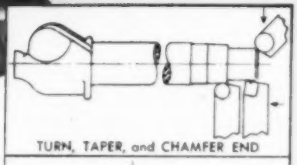
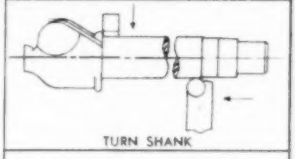
THE STANDARD LINE: Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Rods · Counterbores · Special Tools

Saves $34,560 IN ONE YEAR with KENNAMETAL TOOLING





A manufacturer of automotive steering gears effected annual savings of $34,560.00 by using Kennametal tooling on just one series of machining operations.

Details of the job are given at the right —the basic tools used, Styles RAL and SBR, are illustrated above. This report indicates the enormous savings attainable through the application of modern tooling.

Here again Kennametal proves its worth. A few pennies saved in the initial cost means nothing. Consider these facts: (1) Fewer tools are required, as a rule; (2) Set-up and machine downtime are minimized; (3) Load and confusion in grinding room is reduced; (4) Higher production rates can be reached, and maintained.

Ask us to send you performance reports that show how other shops are achieving cost reduction by tooling with Kennametal.

The operations illustrated above required ten single-point brazed tools. Four Kennamatic tools are now being used. The savings on each 1000 pieces machined is $24.00, as detailed below. A total savings of $34,560.00 was realized over a 12-month period.

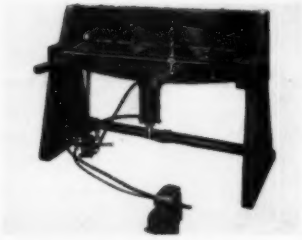
TOOL PERFORMANCE

	Single Point	Kennamatic
Number Required	10	4
Cost Each (Avg.)	$2.50	$4.10
Pieces/Grind	200	1,600
Pieces/Tool Life	2,000	24,000

SHOP COST/1000 PIECES

	Single Point	Kennamatic
Tool Cost	$15.00	$ 1.93
Productive Labor	15.12	9.32
Non-Productive Labor	6.00	0.87
Shop Cost/1000 pcs.	$36.12	$12.12

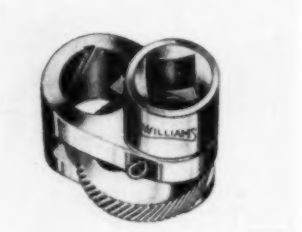
KENNAMETAL Inc.
LATROBE, PA.
MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY



Air-Powered Squaring Shears Operate Off 75- to 85-psi Line

Line of squaring shears ranges in cutting lengths from 36 to 120 in. Shears of 72 in. and less can handle up to 16 gage and the 96 and 120 in. shears have rated capacity of 18 gage. Seventy-five- to 85-psi air pressure is needed for operation. Each shear is equipped with air-valve cylinder and pilot-valve front, back, and side gages, positive holddown and a stainless-steel scale embedded near each end of the table.

Wysong and Miles Co., 60 Fulton St., Greensboro, N. C.



Williams Stud Remover Removes or Sets ¾-in. Studs

No. S-60B stud remover used with ½ in. square-drive handles and attachments is equally efficient for removing or setting studs. An eccentrically-mounted roller with deep-milled edge provides a non-slipping gripping surface which is nonburring. Stud capacity is 5/16- to ¾-in. dia.

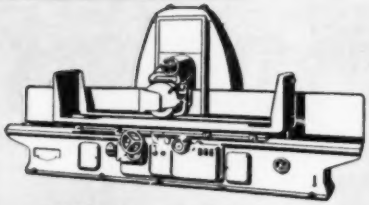
J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y.

Single-Phase Capacitor Motor Features Compact Design

Capacitors are mounted in the base of the Tri-Clad, single-phase electric motor to minimize over-all dimensions. The conduit box has been replaced by a built-in terminal board inside the end shield for easier wiring. Models range from ½- to 5-hp

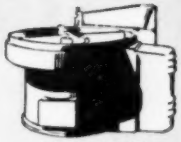
MATTISON GRINDERS

If its a Flat Surface to Grind
There's a Mattison to Grind it.

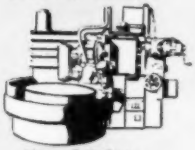


Precision Surface Grinders
Horizontal Spindle

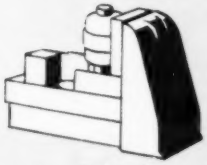
Disc Grinders,
Double Spindle Type



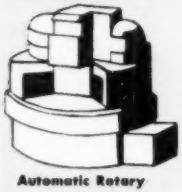
Vertical Spindle
Disc Grinders



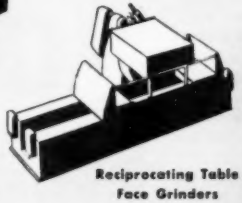
Plano Grinders,
Rotary Table Type



Rotary Table
Surface Grinders

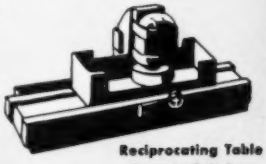


Automatic Rotary
Surface Grinders



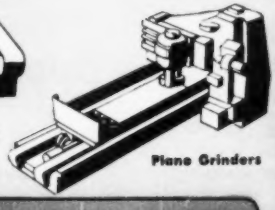
Reciprocating Table
Face Grinders

Disc Grinders,
Single Spindle Type



Reciprocating Table
Surface Grinders
Vertical Spindle

Face Grinders,
Traveling Wheel



Plano Grinders

● With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison now is in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced fixture engineers are available to give you best production efficiency with Mattison Machines.

For any flat grinding, ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalog on all machines, ask for free copy of general bulletin.

200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".

Grinding cast-iron cams — 5" diameter, 1½" thick — stock removal, each side .030". Production, 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.

2½ ton machine-bed ground in 60% less time on Mattison Precision Surface Grinder than required by former method, hand scraping.

Grinding feet of motor frames from rough castings and welded assemblies on Mattison (Hanchett Type) Face Grinder.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

Yes

THERE'S A DIFFERENCE IN CUTTING WHEELS

and in

CUTTING WHEEL SERVICE

Allison

abrasive

CUTTING WHEELS

get the facts

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ABRASIVE CUTTING EXPERT

THE ALLISON COMPANY

256 Island Brook Avenue

Bridgeport 8, Connecticut

SALES

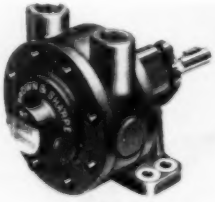
capacity and are available in two types: Type KCS, capacitor-start, is for 115/230-volt operation, and Type KCR, capacitor-run, is of 230-volt design.

General Electric Co., Schenectady 5, New York.

Jiffy Rotary Tools Provide Flexible Shafts

Jiffy power units employing 5-ft flexible shafts are for polishing, routing, brushing, grinding, buffing, drilling, filing, and sanding. The 3-caster Stow Jiffy Tool floor model (top) delivers ¼ hp at 1750 rpm. Both 1/3- and ½-hp units are available. For more complex operations the Stow Speed Jiffy (bottom) has 1000, 1750 and 3000 rpm. speeds. These velocities are obtained by altering the plug-in position of the flexible drive shaft.

Stow Manufacturing Co., Binghamton, N. Y.



Automatic Reversing-Vane Pumps Supply LubeOil at 100 PSI

Nine styles and sizes of these pumps are available as complete units, or as stripped models. No. 8021, 8061, and 8101 are complete pumps with provision for mounting the foot at top or bottom or on either side. Designed for continuous operations against pressures up to 100 psi, capacities at 0 psi are 2.5 gpm for No. 8021, 5.4 gpm for 8061, and 11.5 gpm for No. 8101. Similar capacities are available in the stripped models. This series

STUART'S WISE ECONOMY PLAN

A SCIENTIFIC COST REDUCING PROGRAM

good cutting fluids properly applied

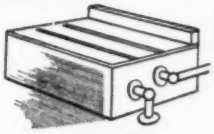
Write, wire or phone for details.

D.A. Stuart Oil Co.

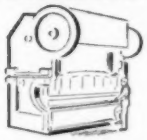
2729 S. Troy St., Chicago 23, Ill.

Simplify production with economical vapor degreasing

BEFORE INSPECTION



BEFORE PLATING



AFTER STAMPING

AFTER MACHINING

BEFORE AND AFTER production steps, Vapor Degreasing can save you time and cost. In one operation, in one minute or less, it thoroughly removes grease and oil from parts made of most materials—of any size or shape. And it reaches almost inaccessible places . . . leaves parts clean, warm and dry.

Get outstanding results with new, improved "Triclene" D Trichlorethylene

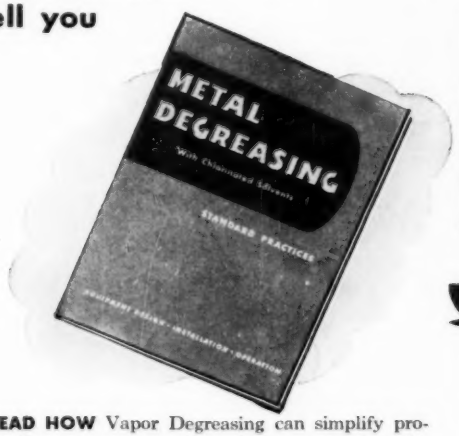
ELECTROCHEMICALS DEPARTMENT
DU PONT
"TRICLENE" D
METAL DEGREASING GRADE TRICHLORETHYLENE
E. I. DU PONT DE NEMOURS & CO. (INC.) WILMINGTON 98, DELAWARE

"TRICLENE" D is the most stable grade of Trichlorethylene yet developed by Du Pont for metal degreasing. It stands up against contaminating and destructive materials which may be introduced in degreasing . . . assists materially in carrying out efficient cleaning.

INTRODUCING "PERCLENE" D

A new degreasing grade of Perchlorethylene for use in metal drying and other vapor degreasing operations in which a higher boiling solvent may be desirable.

Let this book tell you



READ HOW Vapor Degreasing can simplify production . . . save you time and unnecessary costs. Read why the results obtained can't be matched by any other method. It shows typical compact equipment available for efficient and economical operation. And it gives information about solvents used in this equipment—Du Pont "Triclene" D Trichlorethylene, and Du Pont Trichlorethylene and Perchlorethylene—which under various trade marks have been widely used for many years. Send for it today!

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SOLD NATIONALLY THROUGH DISTRIBUTORS

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REG. U.S. PAT. OFF.

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. . . THROUGH CHEMISTRY

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E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Delaware

Please send me my copy of "Metal Degreasing—Standard Practices."

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Position_____

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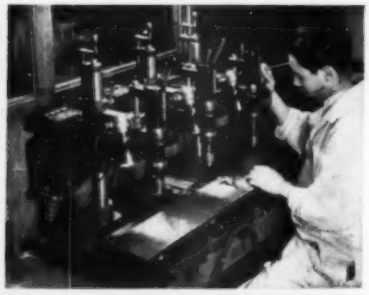
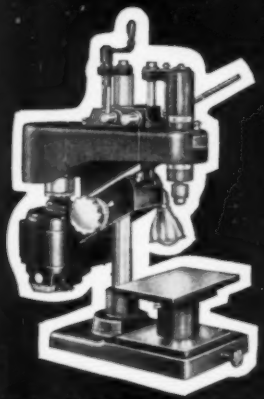


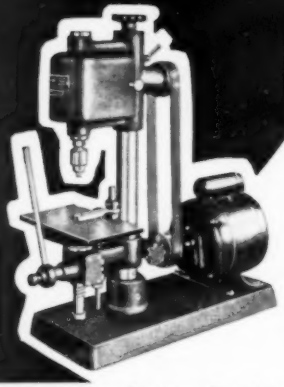
Note in the photo above how the tables butt to form a continuous work surface when machines are installed in batteries.

AT THIS POINT
YOU CAN SOLVE YOUR SMALL HOLE PROBLEM

If your job includes the drilling and tapping of small holes, with surgical precision and on tight production schedules, the two Hamilton precision tools shown here were built to meet your special need. They excel in fast, precision drilling and tapping of small holes in materials as diverse as paper and monel or ceramic and bronze. *And more* their flexibility, sensitivity, and stamina far exceeds the requirements of the average user.



Hamilton Varimatic, Super-Sensitive Drilling Machine. Infinitely variable speeds from 840 to 9300 R. P. M. Drills holes from .004" to 5/16".



Hamilton Super-Sensitive Tapping Machine. Patented power transmission. Tap idles in reverse and automatically changes direction of rotation when pressure is applied to feed lever. Released pressure again reverses spindle, reduces speed to "idle" and withdraws tap. Capacity from the smallest and finest tap to 10–32 inclusive.

For complete specifications and prices write today for our Varimatic Bulletin V-47 and our Tapper Bulletin T-47.

THE Hamilton TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTILVATORS

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

is recommended for supplying lubricating oil and coolant that is comparatively clean.

Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Hand Hardness Tester Checks Plastic, Non-ferrous Metal Parts

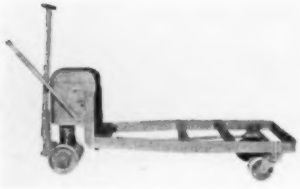
The Impressor is designed for use in any position for testing hardness of fabricated plastic or non-ferrous metal parts. It is said to facilitate accurate readings even when operated by inexperienced personnel. Tests can be made in any area accessible to the operator's hand.

Barber-Colman Co., Rockford, Ill.

Durant Model CS Counter Features Large Figures, Die-Cast Case

Inclosed in a streamlined, one-piece die-cast case, this top-reading rotary counter is available in both reset and non-reset models. Stocked in four-figure cases, these units can be obtained in five- and six-figure sizes as well. Model CS can be incorporated on machine tools, textile, farm, measuring, and office machinery.

Durant Mfg. Co., 1929 N. Buffum St., Milwaukee 1, Wis.



Hydraulic Lift Truck Handles Loads to 6000 Lb

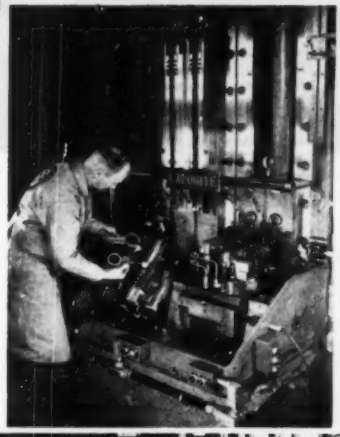
The model MD hydraulic lift truck has a load capacity of 6000 lb and is built in 20- and 25-in. widths platform lengths from 36 to 72 in. The truck employs no oil lines, and the hydraulic pump unit is self-contained. Anti-friction bearings and semi-steel wheels are standard equipment.

Barrett-Cravens Co., 4609 S. Western Blvd. Chicago 9, Ill.

LAPOINTE TIP-DOWN FIXTURES

...the MONEY-SAVING ANSWER

to 80% of all surface broaching installations!



TIP-DOWN FIXTURES are standard equipment on *all* Lapointe single and double ram vertical surface broaching machines, because *they offer so many important operating advantages.* Here are some of them:

TIP-DOWN Fixtures provide exceptionally easy loading and unloading, by bringing the work-holder out front *where the operator can see it and get at it.*

TIP-DOWN Fixtures do not sacrifice any of the stroke available on the machine.

TIP-DOWN Fixtures permit the use of a great variety of work holders that can be manually or hydraulically clamped.

TIP-DOWN Fixtures are constructed to permit fully adjustable work-holders to compensate for broach wear.

TIP-DOWN Fixtures are ruggedly built, having the same sturdy characteristics as the Lapointe Surface Broaching Machine.

THESE FIXTURES ARE F-A-S-T

They're so easy to load that you just *naturally* get greater production through greater speed . . . and without fatigue. You don't tie yourself into a knot, loading a Lapointe Tip-Down Fixture!

WE SUGGEST you write today for descriptive circular on Lapointe vertical broaching machines and tip-down fixtures. Ask for Bulletin DRV-TD-2.

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

HUDSON LAPOINTE MASS

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

1500-ton H-P-M FASTRAVERSE Press installed at Fairbanks, Morse & Co., cut steel wheel production cost.

From sheet stock to finished railroad wheels in only 3 operations! That's the record of the H-P-M 1500-ton FASTRAVERSE Press installed at Fairbanks, Morse & Co., Three Rivers, Michigan. These steel wheels for railroad work cars previously required 11 separate steps to complete. Their H-P-M Press reduced operations to 3! Look what else this H-P-M Press did for Fairbanks-Morse!

• Reduced man power requirements • Reduced production costs • Reduced maintenance costs • Reduced floor space.

Look at H-P-M's production record on this extremely heavy stamping job.

• First operation—100 per hour • Second operation—129 per hour • Third operation—144 per hour.

All these advantages, *plus* the fact that Fairbanks-Morse has experienced no down time since the H-P-M Press was installed six years ago, clearly demonstrate the ability of H-P-M All-Hydraulic Presses to tackle *any* metal-working job . . . whether it's difficult or routine. H-P-M Presses will cut your costs, too. Write today.

THE HYDRAULIC PRESS MANUFACTURING CO.
1002 Marion Road • Mount Gilead, Ohio, U. S. A.

Write today for your free copy of "CASE HISTORIES in the REDUCTION of METAL WORKING COSTS". It tells how manufacturing costs are being reduced in many prominent production plants by H-P-M pressure processing.

HPM

All-Hydraulic Self-Contained **Metal Working Presses**

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

ROUND TABLE *Discussion*

CAN ENGINEERS COME INTO THE SHOP?

It would seem, if Ed is not imagining things, that he must be lacking that quality of personality which is essential, if the degree of respect to which his position entitles him is to be assured. For any draftsman to go into a workshop to seek information on design and, for that purpose, to talk to any Tom, Dick, or Harry, is to court failure. This would reflect as much discredit on his lack of courtesy as on the foreman's failure to insure respect. Whatever may be the status of a visitor, contact with the shop's personnel should be made, always by way of the foreman. No foreman worth his salt would tolerate anything less. He would not be fully in charge, otherwise; discipline requires it.

But, in the case in point, who could be expected to be better informed on questions affecting design from the point of view of manufacture than the foreman or be able to direct an engineer to some man who could give the most useful information, intelligently. To do otherwise would be to put the cart before the horse. It would hardly be more incongruous than for individual workmen to wander into the drawing office and try to discuss design with some draftsman with time on his hands. Sounds silly, but is it sillier than Thomas or Ed?

At the same time, collaboration between the drawing office and the shops is to be encouraged. Particularly is this so when the production experience of the draftsman is less than could be desired. The writer was once associated with an armament firm whose drawing office was an hour's journey from the shops. This was reflected sometimes in the difficulty, if not the impossibility, of carrying out the machining of some of the parts designed. Friendly and courteous cooperation is the better method, but the dictates of common sense should always be observed.

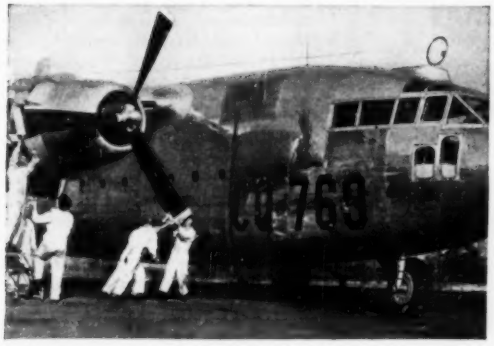
G. E. Powell
Little Eaton, England

•

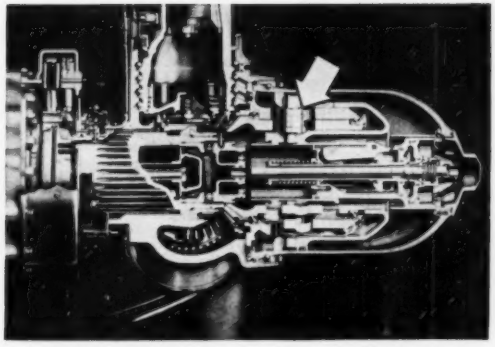
THE ITCH TO TRAVEL

Al apparently is taking the same view that a lot of old-time superintendents used to take. If you quit of your own accord, they took it as a

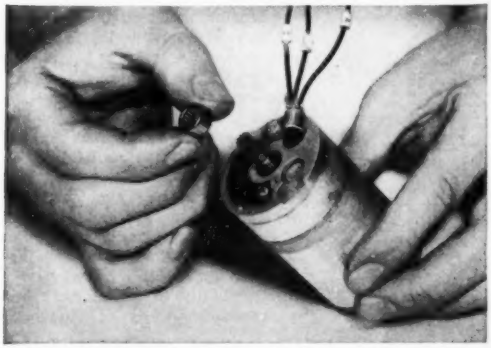
Torrington Needle Bearings provide maximum capacity in compact designs in Hamilton Standard propellers



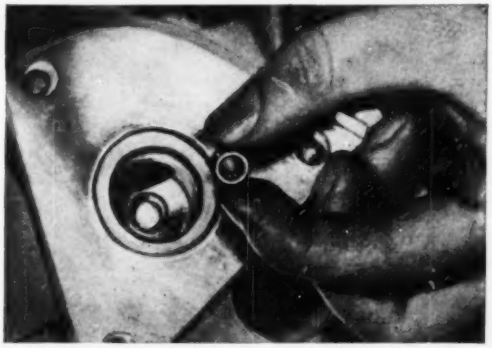
Propeller Synchronization and pitch change mechanisms must be compact, yet absolutely reliable. In several applications, Hamilton Standard Division of United Aircraft Corp. uses Torrington Needle Bearings to secure high capacity, anti-friction operation.



In Cam Roller Assemblies (arrow) of Hamilton Standard Hydromatic propellers, Needle Bearings reduce friction to a minimum. The full complement of Needle Rollers provides the high capacity necessary to carry the heavy loads involved.

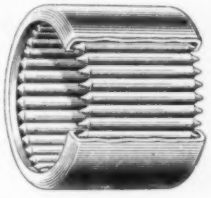


A Needle Bearing is also used on the drive shaft of an electric stepmotor. Here, the Needle Bearing reduces wear and helps to maintain proper mesh between the motor shaft and gearing in an electric head which controls operation of a Hamilton Standard Hydromatic propeller governor.



Space Limitations in this compact gear pump housing of a Hamilton Standard integral oil control assembly are easily met by Needle Bearings. With internal clearances accurately controlled in fabricating housings and shafts, this precision bearing insures close tolerance alignment of the motor pinion gear.

To secure smooth anti-friction operation in compact, high-capacity designs, use Torrington Needle Bearings. Our engineers will gladly lend a hand in design analysis and bearing selection. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities of United States and Canada.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers

"They Switched to SPEED TREAT STEEL PLATE and Cut Machining Time and Tool Costs"

Plus IMPROVING THEIR PRODUCT

CHISHOLM, BOYD & WHITE, Inc., Chicago, builders of brick and clay plant machinery were using cast alloy steel for 10' 9" long side arms for their principal product, quote the "BOYD BRICK PRESS."

The cast arms were susceptible to sand holes, were difficult to machine, required more machining because they were necessarily cast oversize and additional time was required to age the parts.

They switched to Speed Treat (X1545) medium carbon, open hearth steel plate. Arms were delivered flame cut from 5½" thick plate, stress relieved. They are easy to machine and tool life was greatly increased. The "as-machined" surface facilitates final machining. With a tensile strength of 90 - 100,000 p.s.i. they excel the castings formerly used for this service.

Free machining Speed Treat is one of the Holliday cost-cutting Speed Steels. Send for Bulletin 901.

SINCE 1856

W. J. HOLLIDAY & CO. (INC.)

SPEED STEEL PLATE DIV.

137th & Sheffield Ave., Hammond, Indiana

Plants: Hammond and Indianapolis, Indiana

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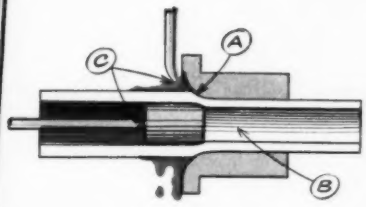
personal insult almost, even if the man had obtained a position paying substantially more money; it was all right if they fired a man, and they often did for a very slight infringement of the rules. Not only that, but in many small towns with two or three plants they were discriminated against, and getting a job again was often impossible. This forced them to obtain work away from home. Many of those fellows became rolling stones, got the itch to travel, never remained too long at any one job. The grass always looked greener elsewhere, although when they arrived they always found there were just as many weeds as in the place they left. The majority of them became exceptionally smart machinists due to their different experiences in different plants on different and varied types of machines and assembly methods, meeting and knowing different executives and machinists.

Will this type of machinist keep on changing jobs? Yes. I have had lots of experience with this type of machinist. They will come in and start work and in a few hours they are producing and equalling anyone's output in the shop. They are as a rule very broadminded and good natured, but they are not to be depended upon to stay. As soon as the itch to move on is upon them, they will come and say, "Well boss I am leaving you today; it has been nice working with you. I'll come back and see you again." He has probably been with you four or five months and been exceedingly satisfactory in every way. You hate to let him go, but it is no good trying to hang on to that type of fellow. So you wish him good luck and tell him he can have a job if you have plenty of work and he comes your way again. They have

"I'll bet this is the last time the boss plays Santa Claus. Everybody is asking for a raise!"

Case 1164—Lubricating in Unusual Temperatures and Pressures



DRAW-BENCH OPERATION

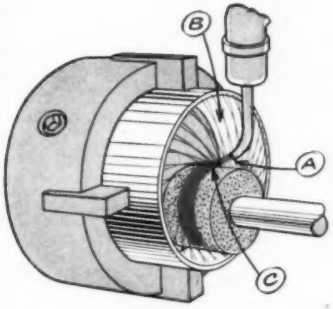
In a cold drawing operation on copper, specially-made Calol Alta-Vis Oils prevented any seizure between dies and work and eliminated degreasing. Lubricant left on work was completely consumed in annealing and left no stain. (These oils are "synthetic"—made by combining petroleum elements in a new form; eventually evaporate completely without leaving any residue.) Recommended for many metal forming operations, and as a carrier for graphite in the lubrication of glass mold cover hinges, kiln cars and other uses where ordinary oils gum and cake, and cause excessive wear and coking. Five grades: 50, 210, 530, 1060, 3060.

A. Resist extreme temperatures and pressures—crack at about 550° F.

B. Will not corrode any metal.

C. Flow freely and may be applied by oil can, grease gun or automatic pressure lube systems...good carriers for graphite.

Case 1151—Securing Efficient Cutting Oil Emulsions



WHEEL-GRINDING OPERATION

In a shop doing various kinds of metal machining, all emulsions of Calol Soluble Oil remained stable and retained their original efficiencies. Rusting was reduced to the minimum, work finish was excellent and tools remained in service for exceptionally long periods.

A. Contains balanced combination of oil-soluble emulsifier and water-soluble wetting agent, and special ingredient to speed emulsification—makes mixing easy and emulsion stable.

B. Cools, lubricates and flushes work and tool rapidly ...helps produce better work finish.

C. Defoaming agent minimizes formation of air bubbles.

Another product, Calol Soluble Oil HV, is generally used undiluted in hard service such as drawing and tube-bending operations. Its solubility allows easy decreasing of work with water.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

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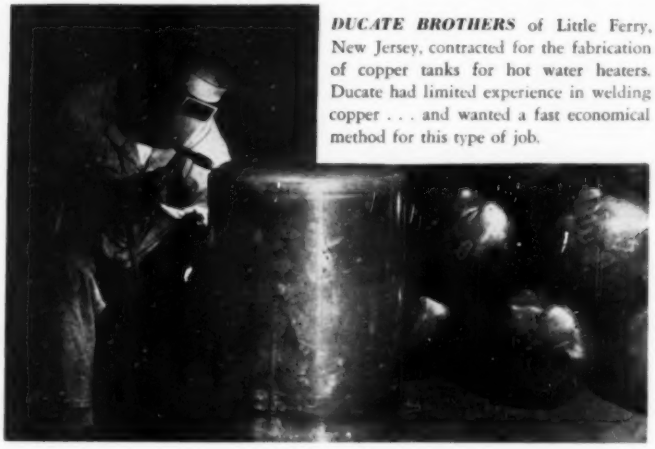
CALOL

Trademark Reg. U.S. Pat. Office

Heliwelding speeds fabrication of copper hot water tanks



DUCATE BROTHERS of Little Ferry, New Jersey, contracted for the fabrication of copper tanks for hot water heaters. Ducate had limited experience in welding copper . . . and wanted a fast economical method for this type of job.

George Kotcher, Airco Technical Sales Representative, was called in to recommend the best, and least expensive fabrication method – one that would avoid loss of time and money. He suggested the use of manual Heliwelding.

The company followed this suggestion, and found that its rate of copper tank production was better than anticipated. More important, the method proved extremely economical, allowing complete control of welding variables – and resulting in smooth, high quality welds.

• • • •

TECHNICAL SALES SERVICE — ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

To assure its customers of high efficiency in all applications of the oxyacetylene flame or electric arc, Air Reduction has available the broad, practical experience of its nationwide Technical Sales Division personnel. The collective experience and knowledge of these specialists has helped thousands to a more effective use of Airco processes and products. Ask about this Airco "Plus-Value" service today. Write your nearest Airco office. (In Texas: Magnolia Airco Gas Products Company . . . On West Coast: Air Reduction Pacific Company.)

AIRCO **AIR REDUCTION**

Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Calcium Carbide . . . Gas Cutting Machines . . . Gas Welding Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

been of great help in many shops when they needed really skilled help at the right time.

Sometimes a man of this type will meet a girl in his wandering from town to town and settle down. But as a rule it is only when old age compels them to stay put that they finally call it a day, and all they have to show for all their life's work is a few hundred dollars, no place to call home and, of course, no friends. But they will tell you it all has been lots of fun and they say they would follow the same pattern if they were young again.

When a machinist and his boss come to the parting of the ways through dissatisfaction on either side, I don't believe today that it makes any difference to the man's effort or his cooperative spirit if he is re-hired in the future.

As a matter of fact, if he comes back at all it shows that he has no great grievance, if any, and in fact a man re-hired generally falls over himself to satisfy the boss. Life is far too short, I believe, to let little differences to warp our judgment, and affect adversely our dealings with our fellow creatures.

I do not see at all why they should not be given a job, if they were satisfactory when they worked for you previously up to the point where they separated. You know, after all, if a plant becomes very slack and they are compelled to lay off help (it happens every day in some shops) I don't see any difference whether the man leaves you of his own accord, or due to slackness you have to dispense with his services.

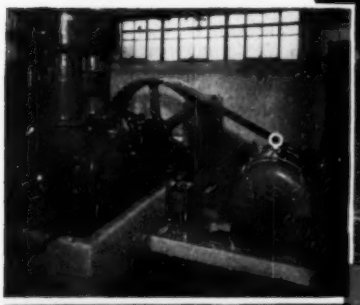
It's a free country, Al; the employer pays so much money for a man's services. He generally terminates such service when he sees fit, for most any reason, just in the same way you stop going to a store if you are dissatisfied with the goods you receive for the money you pay for them.

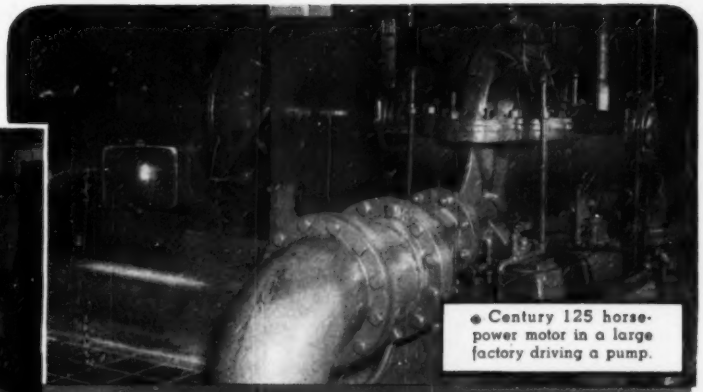
It is necessary to change jobs today. With all industries changing their production methods, materials and equipment, and also the large amount of new products entailing new revolutionary types of equipment and skills, any young fellow cannot possibly get all the experience he needs to feel confident of continuous work and to be able to support wife and family.

He has to work, say, in half a dozen plants where the products are widely diversified, before he can feel entirely proficient, confident that if he loses his job he can reasonably expect to get another by reason of his diversified experience.

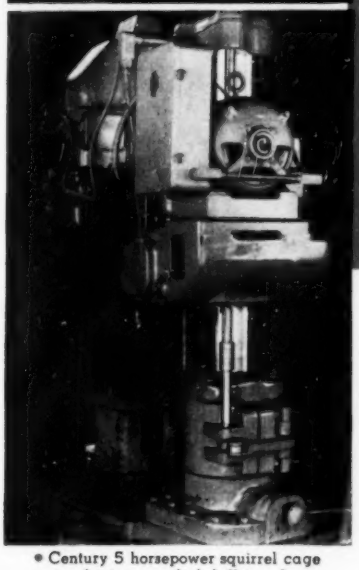
In conclusion, of course, if a ma-

● Century 100 horsepower squirrel cage motor driving a refrigeration compressor.





● Century 125 horsepower motor in a large factory driving a pump.



● Century 5 horsepower squirrel cage motor driving a radial drill in a large metal working department.

Century MOTORS

Stay on the Job

—Provide Satisfactory Performance Throughout a Long Motor Life

There is a *correct* Century motor available to furnish economical power for all popular industrial and commercial applications.

Century polyphase motors are available in addition to the type SC for all normal torque applications—type SCH for high starting torque; type SCT for high torque with high slip; type SR for high starting torque with low starting current and adjustable varying speeds; and Selective Speed Drives for flexible control of automatic operations.

For protection against atmospheric hazards Century offers:

Drip Proof General Purpose Motors — protection against falling solids and dripping liquids.

Splash Proof Motors — protection against splashing liquids, rain, snow, sleet and ice.

Totally Enclosed Fan Cooled Motors — protection against dusts, mist and fog.

Explosion Proof Motors—protection against explosive dusts and gases.

Century motors are built in sizes from 1/6 to 400 horsepower for operation on single phase, polyphase and direct current.

Specify Century motors for all your electric power requirements.

400 horsepower squirrel cage ball bearing motor.

Century open protected squirrel cage motor.

Popular types of standard ratings are generally available from factory and branch office stocks.

CENTURY ELECTRIC COMPANY

1806 Pine Street
St. Louis 3, Mo.

CE-843

Offices and Stock Points in Principal Cities

TRAILER HITCH MANUFACTURER
GAINS ALL 'ROUND IMPROVEMENT
BY CHANGING TO

UNITCASTINGS!

AS A UNITCASTING

- Cost Substantially Less!
- Machine Work Reduced!
- Appearance Improved!
- Accuracy Eliminates Mis-Fits!

This product was really planned from all angles! After the mechanical success of the pilot model, using a weldment, the manufacturer figured production costs, sales appeal and qualifications such as durability. Although the weldment served its purpose for experiments, *it didn't answer any of the marketing problems!*

Unitcast engineers solved the difficulties. Toward a quality product, *Unitcastings* contributed a low *finished* cost; the trailer hitch had eye appeal; and all parts were accurate and durable. The job had been made right with steel castings . . *foundry engineered to fit the job!*

UNITCAST
Corporation
QUALITY STEEL CASTINGS

Unitcast will welcome the opportunity to provide a "cast steel" answer for your parts problems, too. Our suggestions toward design, *while your product is still on paper*, may save you many dollars in time and future revisions! Write or call today! Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

chinist is satisfied just to remain one, he probably can get all the experience he needs in two or three shops. But if he is determined to go ahead and has personality and the natural ability of a leader, is cooperative, and has a real enthusiasm for the trade, he will be wise I believe to cram all the different kinds of experience to be gained from a dozen shops, large and small, with a year or so in maintenance work. Then later he will be richly rewarded by the know-how he has acquired, which he can pass on to the gang he is supervising.

Arthur Silvester
Niantic, Conn.

•

I have been in the machine line for 49 years, having served an apprenticeship as a machinist in a locomotive shop in 1900-1904. At that time I noted by observation that the better mechanics were floaters and with a strong desire to be among the best I decided I would have to move.

Therefore at the completion of my apprenticeship I was on my way to get some of that experience that I had heard from others. For 20 years I floated, always staying as long as I desired as I never have been fired (one experience I have yet to have) and never leaving a job half done.

I would say to the ambitious young man, move often if it is only from one dept. to another in the same plant, bearing this in mind: "never leave a job half done," stick till the job is finished.

Naturally I was always on the lookout for something better (money no object), precision being the main issue or something beyond the ability of the average mechanic.

I traveled from locomotive shop to the tool end of a varied industry, shoe machines, typewriters, adding machines, phonographs, light bulbs, cold header tooling, textile machines, steel sash, airplane motors, watch work's tools machines and dies, rifle gages, form cutters, shell dies, auto accessories, and numerous job shops.

After all the experience what have I?

But I still say change, and often.

They say a "rolling stone gathers no moss" but to counteract that there is another adage which says, "A setting hen gathers no fat."

It is very difficult to get rid of that itchy foot. A rolling stone will stop rolling where it reaches an upgrade and that could be represented by something interesting.

There is a reason for every man leaving his job and if rehired without eliminating that reason he will

NEW "QUICK-LOCK" ADJUSTABLE ADAPTER ASSEMBLIES

for multiple spindle machines

by SJ SCULLY-JONES

7 COST CUTTING advantages!

YOU GET **IMMEDIATE DELIVERY** of these **NEW** "QUICK-LOCK" ADJUSTABLE ADAPTER ASSEMBLIES **FROM STOCK.**

No thread damage. Set screw does not touch threads.

Stronger, low cost Adapter body. No milled slots.

Your initial cost, set-up time, replacement costs and other economy factors were considered in the design and manufacture of these *New* Scully-Jones "Quick-Lock" Adjustable Adapter Assemblies, that give you seven money-saving benefits.

1. **LOW INITIAL COST.** Savings in manufacturing costs, which we effected by eliminating 4 milled slots in adapter body, are passed along to you.
2. **REDUCE YOUR SET-UP TIME.** Quickly adjusted friction-type nut, locks instantly *any place* on adapter threads.
3. **CUT DOWN YOUR REPLACEMENT PURCHASES.** Last longer; no milled slots to weaken adapter body; no thread damage with *New* "Quick-Lock" Nut.
4. **REDUCE YOUR REJECTS.** National Acme Threads assure accurate fit. Squareness of top face of nut to threads, prevents distortion.
5. **END GUESSWORK ON FINE ADJUSTMENTS.** The "Quick-Lock" Nut is calibrated in steps of .001" for infinitely fine adjustments.
6. **WORK ON CLOSE CENTERS.** Small diameter of nut permits use on Spindles operating on close centers.
7. **MEET ALL YOUR REQUIREMENTS.** Available in wide range of sizes to fit all popular Multiple Spindles.

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YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

Lovejoy Type "A" milling cutters are unsurpassed for removing metal quickly, accurately and smoothly. And a big PLUS feature is blade design—H.S.S., carbide and cast alloy blades are interchangeable in any Lovejoy Type "A" housing ever built—from 4½" to 24" in diameter! No need to carry a large stock of blades because Lovejoy gives immediate delivery from its own large stock.

Another asset is Lovejoy's exclusive "positive-locking" device. This means that a minimum of stock must be removed when sharpening blades. It allows use of a large percentage of each blade. It holds blades immovably even during heavy intermittent cuts.

The Lovejoy man near you will be pleased to give details and production estimates on your own work.

"TOOL BITS"

Type "A" face mills are available for all standard arbor mounts (National and Lovejoy) and standard spindle mounts (National, Ingersoll, Universal, Giddings & Lewis and Lucas). Details will be found in Lovejoy Catalog No. 28. If you have unusual jobs requiring special cutter designs, call on Lovejoy the "specialists on specials."

Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

Write for Catalog No. 28

never cooperate with his employer.

After the first World War I decided it was time for me to settle down and in 1923 I located what I wanted, a place to use considerable of what I had learned, and for 19 years I stayed at the one plant until World War II created a demand for gage makers, and enticed me to change for a gage job. And now at 64, I am without a job and find that experience means nothing, or perhaps I have not contacted the right people.

I contend that if industrialists paid more attention to hiring older men who have floated they would overcome considerable of the unrest and strike situation, as I have learned that the poor mechanic when dissatisfied creates unrest by trying to get others to support him; whereas the older man who has floated, when he gets dissatisfied he will step out, as he holds a job by his knowledge.

J. W. A.
Dearborn, Mich.

•

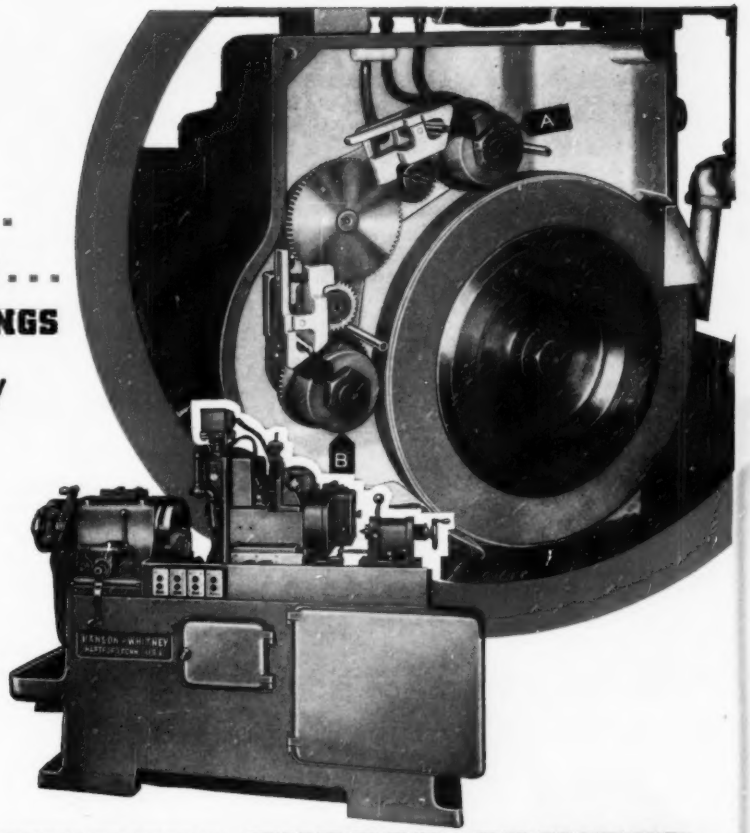
Time and experience have proved that a mechanic should get around in a few shops to broaden his knowledge of a trade and establish confidence himself.

Another angle to this question is that very often a man gets dissatisfied with the shop, thinking the fellows in some other shop are treated better. Perhaps they may be. However I have seen them try it out and then come back somewhat wiser than when they left. I have had them admit that while the other shop had this and that different, they had made up their mind something in the old shop exceeded the newly tried out shop and they made up their mind to return.

I remember one man who became a chronic fault finder in the shop and got out into another shop. When he left the firm decided never to employ him again. This man changed so much by the new environment that when he was laid off in the new shop, the old firm changed its decision and rehired him. The man took hold with a much deeper interest in his work.

Years ago I saw an apprentice going sour after he had served his time. I advised him to get out for a time from the old environment. Some years later he returned full of constructive ideas and was made foreman in time. So he became an asset to the firm that gave him his training. Now, had he remained right along in the original shop in his status of no outside experience and his sourness he would have been a

EASIER...
FASTER...
MORE...
WHEEL DRESSINGS
at lower cost!



A FEATURE
OF THE

HANSON-WHITNEY THREAD GRINDER

This page has been arranged for but one purpose . . . to induce you to *see* the new Hanson-Whitney semi-automatic Thread Grinder at work. It is impossible, in restricted space, to explain the importance of this engineering achievement . . . to provide the close-up photographs that bring out the many design innovations . . . nor can we show you the accuracy, the speed, the quality of production.

But we *can* arrange an appointment that we believe will interest anyone who needs a better, faster, method for grinding external threads from the solid on a production basis.

You will see a Master Roll (A) that re-trues the Grinding Wheel for re-grinding the Crusher Roll (B) in position, whenever its pattern has been worn by repeated crushing of the wheel. This means uninterrupted production for a long time . . . until the original Master Roll thread pattern itself becomes worn.

This is but one valuable feature of this machine. If the 2" (long) threading capacity... produced in 1-1/6 revolutions of the work... meets your needs, we ask you to write us.

CATALOG AND PRICES ON REQUEST.

HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

Hanson Whitney
PIONEERS OF FINISHED TAPS

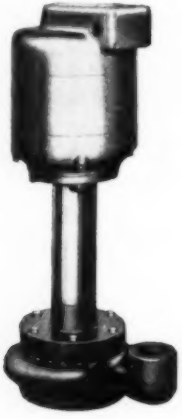
Photo Courtesy of Sibley Machine & Foundry Corp.

Illustrated is a Sibley model C-20 Drilling machine equipped with model 1-P3-9030 Short 1/10 HP Ruthman Gusher Coolant Pump.

WHERE COOLANT COUNTS

It's RUTHMAN GUSHER COOLANT PUMPS

In all metal cutting operations, where correct coolant flow is essential to efficient, fast production, Ruthman Gusher Coolant Pumps give outstanding performance.



Efficient in operation, Gusher Coolant Pumps are low in initial cost, easy to install and economical to operate.

To end your coolant worries insist on Ruthman Gusher Coolant Pumps on all your metal cutting equipment.

Write for our new Catalog today.

THE RUTHMAN MACHINERY CO.

1818 READING ROAD **CINCINNATI, OHIO**

liability to the firm and little good to himself.

I have my own experience to back up the value of outside experience in a business. I had served my time in a certain shop and had branched out into another where I was foreman toolmaker. Wm. Knudsen had made my acquaintance and encouraged me to come to Detroit. I did not like the setup where he was. So I took on a job at a metalworking shop. Several years later I returned here to take on work in a shop making the same lines the shop I had served in made. This shop bid on the patent ice cream dish with the paper liner. None of their diemakers could roll the edge as specified and the firm was about to lose a big contract as a result.

A kink I picked up in Detroit was used and it worked, saving the day for us. That little kink paid that firm in several repeat orders.

In another instance a breakfast food concern called me in away from this employer to make some automatic packer parts. I found a dumb engineer trying to build an automatic oven on which several hundred thousand dollars had been wasted. Now, in my travels I had seen big dryers and match oven drives. So I submitted a plan from these examples that worked out O.K. The engineer saved his job, as he was to be fired. The idea was granted a patent to my surprise and has run some 20 years O.K. These are authentic experiences in my life that show travel experience can be quite an asset to an employer and I don't think some appreciate the fact as fully as they might do in our favor.

The man who gets out for experience for a few years can face the world with more confidence in looking for a new job if the old one folds up suddenly in later years, providing plants in his locality are not

"I don't see why they don't break down and buy a long extension."

RELIANCE V★S DRIVE

NOW... NEW V★S DRIVES

(¾-2 hp.)

for Thousands of Additional Applications

The new V★S Drives are now available in ¾, 1, 1½ and 2 hp. sizes. Compact control unit is approximately 11" square, 30" high—weighs under 75 pounds.

The Original Packaged All-Electric, Adjustable-Speed Drive for A-c. Circuits

at a price everybody can afford!

Adjustable Speeds from A-c. Power for GREATER PRODUCTION at LOWER COST!

Here is a simple, space-saving, low-cost *All-electric* Adjustable-speed Drive. This V★S Drive utilizes the same fundamental principles employed in the design of *all* Reliance V★S Drives for over 11 years.

UNLIMITED SPEED CHANGES. Provides an unlimited selection of speeds over a wide range—*electrically.*

JOGGING AND CREEPING SPEEDS. Selector switch provides for slow, jogging speed. Creeping speeds available through speed adjustor.

REMOTE CONTROL. Push a button and twist a knob—at the machine or at any remote location—for *instant* action.

QUICK, SMOOTH STARTING AND STOPPING. Offers fully controlled starting and stopping. Dynamic braking is available.

SPACE-SAVING. Compact, adjustable-speed drive motor connected to the driven machine saves valuable production space.

SIMPLIFIED DESIGN. Simplest design ever achieved in a packaged, all-electric adjustable-speed drive operating from A-c. circuits.

ADAPTABLE. The new V★S Drive can be easily applied to existing machines or built into machines as original equipment.

Machine builder or machine user, it will pay you to have all the facts on this important extension of the V★S line. Write today for Bulletin D-2101.

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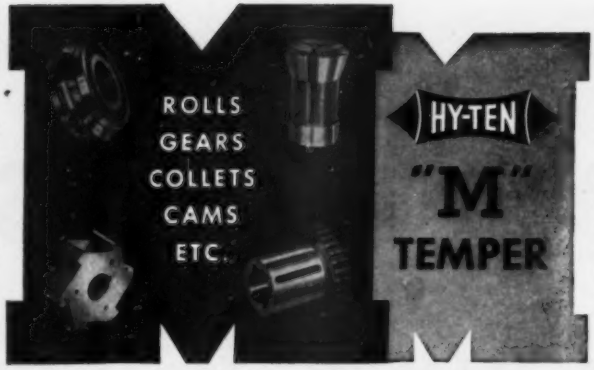
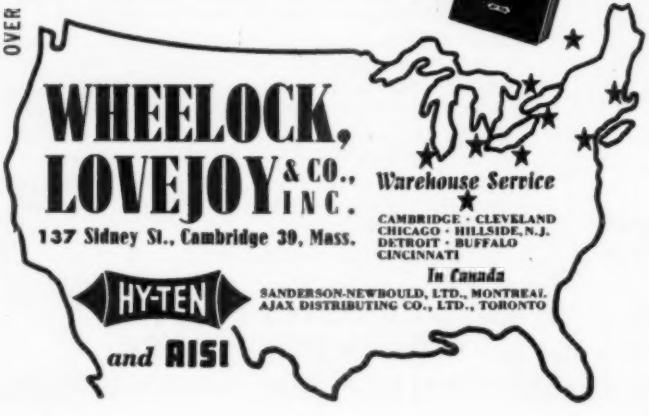


THE ALLOY STEEL THAT'S *MEANT FOR PUNISHMENT*

"M" TEMPER oil hardening steel was developed specifically for such vital, punishment-taking parts as dies, cams, collets, forming rolls, clutches, gears, etc. "M" TEMPER effectively combines high hardness with maximum toughness, minimum distortion, extreme density and great strength – properties that ideally combine to resist wear and breakage. This grade develops the advantages of the powerful alloys – chromium, nickel and molybdenum. Moreover, "M" TEMPER has excellent forging properties and is readily machinable in the annealed condition. Although low in cost, "M" TEMPER has non-deforming properties comparable to, and in many cases superior to, much more expensive steels.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.



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HY-TEN and AISI

drawing the line on mechanics over middle age. Due to pension plans, seniority rules and this overage discrimination in some places a word of caution is not out of place here.

I would say be careful of going out to garner experience after one has reached middle age or what has become known after that period as over-age.

Today we find industry so highly specialized that in some instances, as in specializing on machines, there is no call for a man to get around for experience. It is all worked out for him by experts hard to beat.

Years ago we had a lot of fellows who could not settle down. There are not so many of this class wanting a change every few months. They are of little good to themselves and less to an employer and don't deserve a job, as they upset industry too much. I believe they as an average, become too much of a nuisance and settle down too late in life. My personal opinion based on experience regarding quits and rehires is that you must consider each case individually. The man and circumstances should goven your judgment.

Henry Rasmussen
Niagara Falls, N. Y.

NEW BOOKS

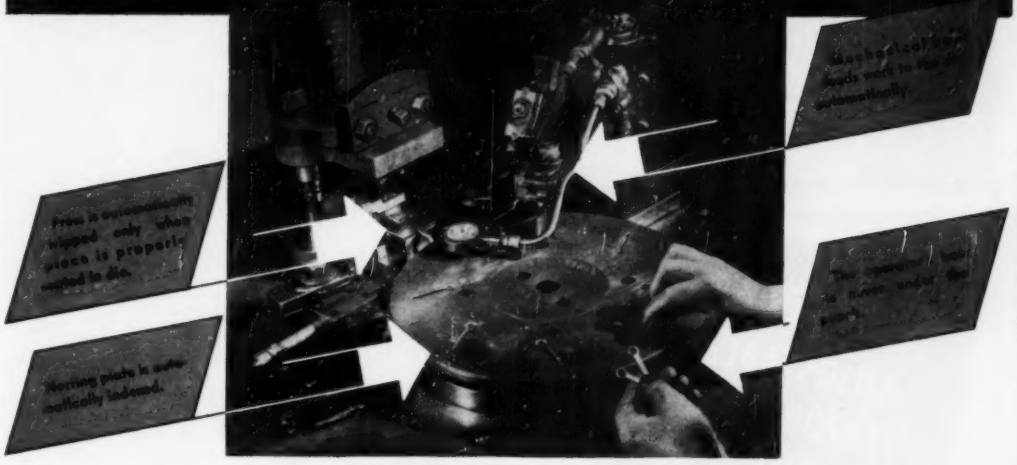
TECHNICAL SKETCHING AND VISUALIZING FOR ENGINEERS. *By Hyman H. Katz, Director: Technological Division, Allied School of Mechanical Trades, Chicago, Ill. 160 pages, 7x9 in. Published by The Macmillan Company, 60 5th Ave., New York, N.Y. Price $5.*

Engineering courses stress mechanical drawing, standard projections, and advanced geometry, but usually fail to consider at any length the problem of visualizing. Many engineering companies and departments require currently that engineers be able to make quick, expressive sketches of parts, tools, and machines. Many engineers pick this technique up in time, but for those who have not, those who have just completed standard drafting courses, and students still in school, this text should be a great help.

Illustrated profusely by the author, the book considers orthographic sketching, pictorial sketching, proportions, shading, and visualization. Free-hand drawing experience is not necessary before the book can be followed, but knowledge of projection principles is. One section covers measurements taken from models for

Here it is!

The V & O FEED-O-MATIC Press Feeder that increases punch press production 50 to 200% *with Safety!*



Users will tell you: When the V & O Feed-O-Matic takes the place of manual feeding for secondary die operations — punch press production increases 50 to 200%!

What's more, the V & O Feed-O-Matic reduces operator fatigue by automatically tripping the press. The operator simply — and with safety — places each piece into the automatically-indexed nesting plate, which conveys the blank to a micro-switch-equipped mechanical hand that transfers it to the die.

The V & O Feed-O-Matic increases die life, too. First, by placing work in the die with undeviating accuracy, wear on dies is minimized; second, by not tripping the press unless the part is in register, costly shut-downs, caused by damage to dies and presses, are averted.

The V & O Feed-O-Matic can be applied to any make of press . . . requires no special dies . . . and can be set-up for new work in an hour or less.

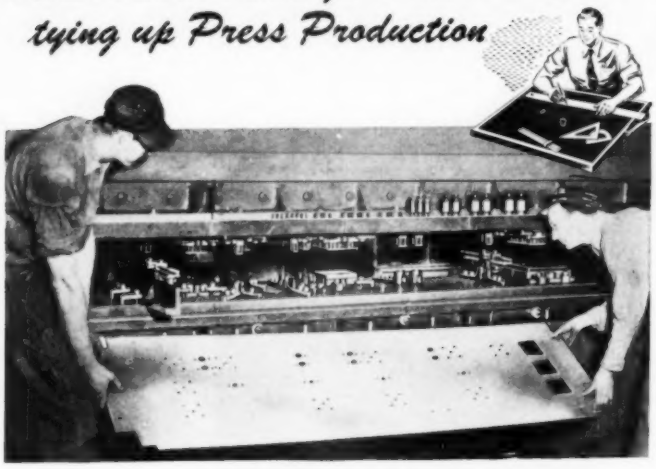
FREE BOOKLET
Write, today, for your copy of the illustrated Feed-O-Matic booklet, which gives you full details, including specifications.

the **V&O PRESS CO.**

DIVISION OF ROCKWELL MANUFACTURING CO.

. . . Hudson, New York

Meet sudden change-orders without tying up Press Production



WHISTLER ADJUSTABLE PERFORATING DIES
quickly and easily rearranged

Change-orders from the engineering department usually cause plenty of headaches in production... particularly where die piercing operations are involved.

But, if you're using Whistler Adjustable Dies, there is no lost time—no waiting—no extra die expense. The same dies are easy to rearrange to the new design. Add units from stock, or delete sizes and shapes no longer required. Arrange the new set-up right on the press.

Consider the savings in production time alone. Then think how continued re-use of the same dies in subsequent jobs writes off first cost.

Whistler Dies can be used in practically any press. All parts are interchangeable. Precision is assured on long or short runs. Closer centers permit fewer press operations.

Deliveries are quick... little or no waiting. Standard round punches and dies up to 3" are available from stock. Ovals, squares, rectangles and special shapes made up in a few days.

WRITE for the Whistler Catalog today and get all the facts!

S. B. WHISTLER & SONS, INC.
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drawings, and explains common shop measuring equipment. Plenty of sample shapes are shown, so even non-artistic draftsmen can get an idea of how to make a presentable sketch.

•

PHOTOGRAPHY IN ENGINEERING—*By C. H. S. Tupholme. Published by Chemical Publishing Company, Inc. 26 Court St., Brooklyn, N. Y. 276 pages, 5¾ x 8¾ in. First American Edition. Price $6.50.*

Volumes have been written on various aspects of technical photography, most of which concentrate on one phase to the complete neglect of all the rest. Result, a definite gap in American engineering literature for a practical book covering a cross-section of the more important applications and methods. Here is the book to fill that gap. From chapter one covering the photography of drawings and documents, through laboratory, radiography, x-ray and election diffraction, microradiography, and infrared, to a final section on instructional motion pictures, the volume is well presented and profusely illustrated.

Drawing upon British and American practice, Mr. Tupholme is able to present a wide viewpoint and a variety of techniques. He has done so in a manner readily understandable to the engineer who has only a basic knowledge of photography. Thorough indexing for instant reference has also been provided. This book should be of value to students, to practicing engineers, and to management in its constant effort to improve teaching, recording, and inspection.

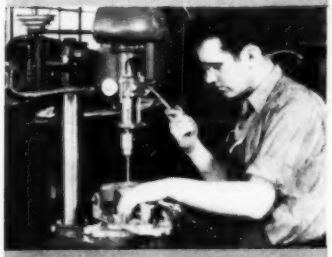
•

THE REVIEW OF CURRENT RESEARCH. *186 pages. Published by Engineering College Research Council. Order from F. M. Dawson, care College of Engineering, State University of Iowa, Iowa City, Iowa. Price, $1.75.*

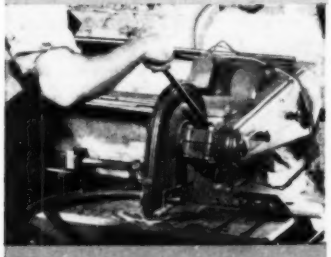
There is a growing realization in industry that university-research facilities can be an important adjunct to a company's own research department or serve as consultants where none exists. Hence, this 1949 Review will be of interest because it lists 82 educational institutions with membership in the Council and describes the administrative policies and titles of all studies currently active. These 4000 projects represent expenditures of over $35,000,000. A complete index is provided for all subjects and the engineering departments involved.

Delta's line of band saws includes Delta 14" Metal-Cutting Band Saw, shown in use here, and the new Delta 20" Band Saw for cutting wood, plastics, and soft metals such as brass, copper, and aluminum.

Delta's line of abrasive finishing machines includes the Delta Abrasive Belt Finishing Machine used above, the Delta Abrasive Disk Finishing Machine, and the new Delta Belt Grinding, Polishing, and Deburring Machine.



Delta's line of drill presses include 14" and 17" single- and multiple-spindle, bench and floor models, with manual or power feed. Also included are Delta Super-Mill* Drill Presses, for small-hole work from .025" to ½" diam.



Delta Cut-Off Machines are available in a non-ferrous model and an abrasive model that is also adaptable for cutting wood.

Delta's line of grinders includes this Delta Toolmaker* Surface Grinder, as well as the Delta Toolmaker Chip-Breaker Grinder, Delta Toolmaker Tool and Cutter Grinder, Delta Carbide Tool Grinder, and Delta Grinder with Twin-Lite* Safety Shields.

Here's how DELTA-MILWAUKEE® Machine Tools help you *maintain volume and quality — with big savings*

There are many ways you can use low-cost Delta-Milwaukee Machine Tools to cut your operating costs, without penalizing output and quality: Here are three . . .

1. You can build high-production, special-purpose machines using standard Delta components—without the delay and heavy capital outlay ordinarily involved in buying inflexible special machines of limited usefulness. Machines using Delta components are readily convertible when change overs are required.
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3. You can utilize the portability and compactness of Delta-Milwaukee machines to revise or supplement your present production methods, for more efficient operation.

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Delta's savings in cost—and in weight and space—are not obtained at the expense of quality. They result from advanced design and from quantity production of standard models.

Take advantage of the many uses of Delta-Milwaukee machines, to cut your investment risk in tools and retain more liquid working capital. Inspect them at your nearby Delta distributor. Ask him about buying on easy time payments.

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BETTER, FASTER SERVICE WITH THIS *COMPLETE* MAC-IT LINE!

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Most experience. More than 25 million shipments handled by Air Express.

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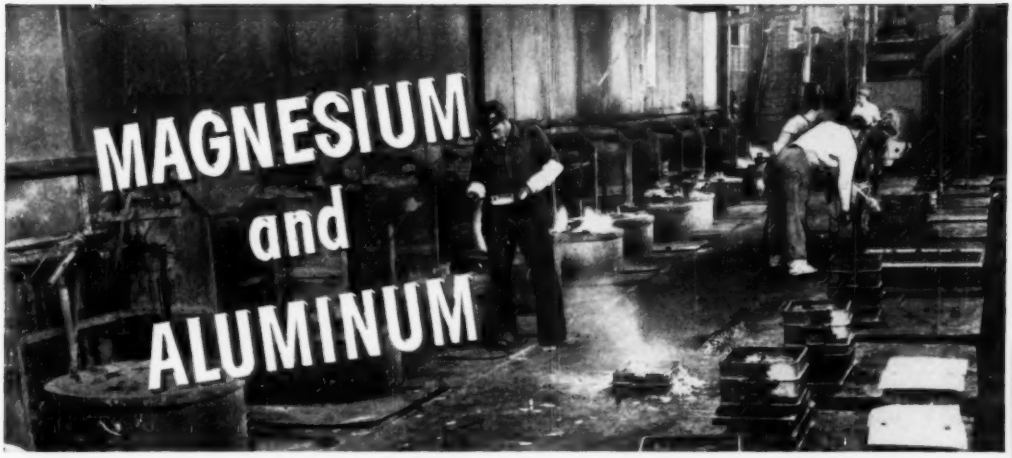

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From the complete metallurgical and X-ray laboratories to the final inspection before shipment, every department in the Eclipse-Pioneer Division Foundries employs the most modern techniques and testing devices available. In addition, every phase of production is conveyorized and mechanized for more economical and efficient handling of materials—a feature which is reflected in the reduced cost of the fine quality castings. During more than nineteen years of experience with difficult casting problems, the Eclipse-Pioneer Division Foundries have produced such diversified items as all-cast parts of the lightest known lawn mower, lightweight hand power tools and aircraft gun turret gimbals. For more detailed information send for Eclipse-Pioneer's illustrated Book of Facts today.

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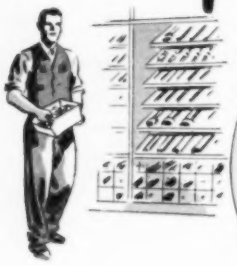
Everybody's sold on PARKER-KALON SIZE-MARKED socket head cap screws



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like 'em because sizes are issued correctly and the size-mark speeds up sorting of left-over, mixed-up screws . . . eliminates waste.

Assembly workers

like 'em because they can spot the right size at a glance. No need to waste time guessing or gauging.

Apprentices

like 'em because the correct size and thread pitch, clearly marked on the screw head, helps them learn faster . . . work faster.

Yes, and Sales managers

like 'em — they recognize the sales advantages of the size-mark to customers' service men in the field on reassembly jobs.

with GEAR-GRIP -fingers won't slip*

Parker-Kalon Gear Grip prevents fingers from slipping even when oily. Makes fast fingers *sure* fingers.

ONLY ON PARKER-KALON Socket Screws will you find the Size-Mark and Gear Grip . . . developed after extensive study of shop practice to speed work. Samples Free, on request. See why P-K "years ahead" Socket Screws can put your product out front, assembly-wise as well as sales-wise. Send for Stock List Now. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y.

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Automatic loading and ejection of parts and automatic size control on these MICROMATIC Hydrohoner machines give increased production, reduced handling costs and improved quality.

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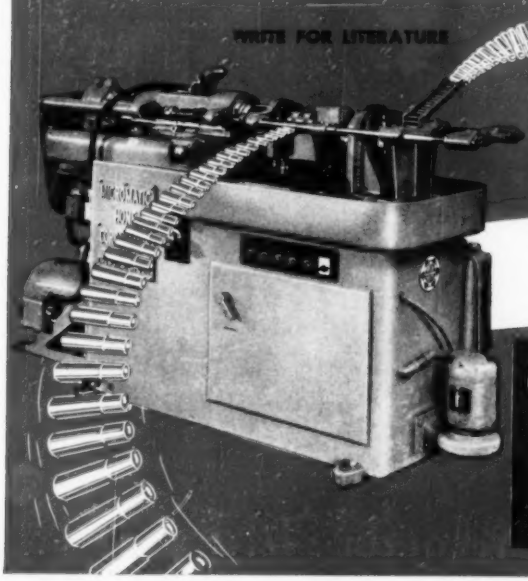

DOUBLE SPINDLE MODEL 705-2 HYDROHONER
Automatic production over 400 gears per hour.

QUILL TYPE HORIZONTAL MODEL 523 HYDROHONER
Automatic production over 250 valve guides per hour.

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THESE *Extra* CONTROL FEATURES

at No Extra Cost . . . IN OILGEAR BROACHING MACHINES

Ever since Oilgear pioneered fluid power broaching many years ago, Oilgear has constantly sought to anticipate new needs in the broaching art . . . in order that this versatile tool might be made progressively better and more productive. Today, Oilgear Broaching Machines incorporate, as *STANDARD*, many features not furnished in other machines or only available at extra cost.

FEATURES OF OILGEAR ELECTRO-HYDRAULIC CONTROLS

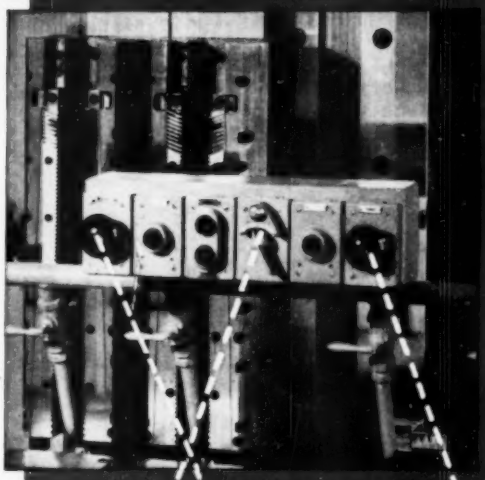
(The product of Oilgear's superior design and engineering)

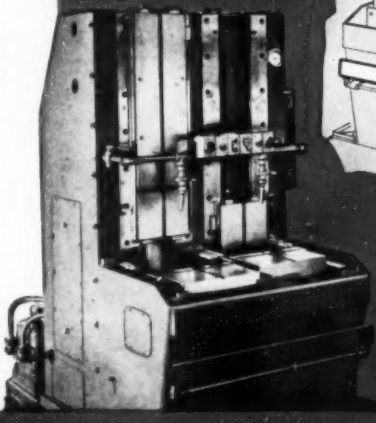
CYCLE SELECTOR. Manual push-button, semi-automatic or full-automatic operation is selected quickly with ease through a nearby switch. There are no pilot and sequence valves and load and fire mechanisms to reset or cause trouble. Selector switch can be locked to prevent tampering by operator and damage to tools and fixtures.

SAFE CONTROL. Dual push-buttons protect operator against accidental starting of machine. Safe starting of broaching cycles is simple. There are no control levers, links, springs and valves to require overtravel, tire the operator and reduce production. Response to controls is instantaneous and positive; there's no needless, time-taking overtravel of tool.

EMERGENCY STOP. Operator can stop machine instantly at any point in cycle with emergency push-button or knee bar. There's no bending or balancing on one foot to depress a pedal or struggle to shift a lever. It's another factor of safety for operator and machine.

PROTECTED SWITCHES. Limit switches are mounted inside machine; protected from cutting fluid, chips, shop dust and other causes of damage. Relays are concealed in control panel on side of frame for easy inspection.





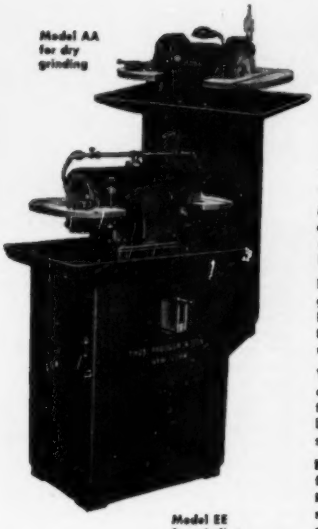
These are only a few of the many exclusive features of Oilgear Fluid Power Variable Speed Broaching Machines. Write for complete descriptive bulletins. THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

Oilgear Fluid Power

BROACHING MACHINES AND BROACHING PRESSES

GRIND TOOLS TO EXACT ANGLE ..FASTER



Model AA for dry grinding

Model EE for grinding wet or dry

PROSSER CARBIDE GRINDERS

YOU GET the grinding angle you want *instantly* with the famous indexing feature of these Prosser high-speed grinders. The quick-acting tables need never be raised or lowered—and once set, they stay put.

ECONOMICAL—You'll save time and you'll get more for your wheel dollar with a Prosser because wheels are easily adjusted to compensate for wear. Wheels can be used up practically 100%.

VERSATILE—Designed by the same Prosser engineers who introduced cemented carbide to American industry, today's Prosser Carbide Grinders are equally effective on stellite and high-speed steel.

Before you get a grinder for rough work or fine finishing, wet or dry...get the facts on the Prosser. For details on bench and floor models, on chip-breaker, drill-grinding and other attachments...write for literature.

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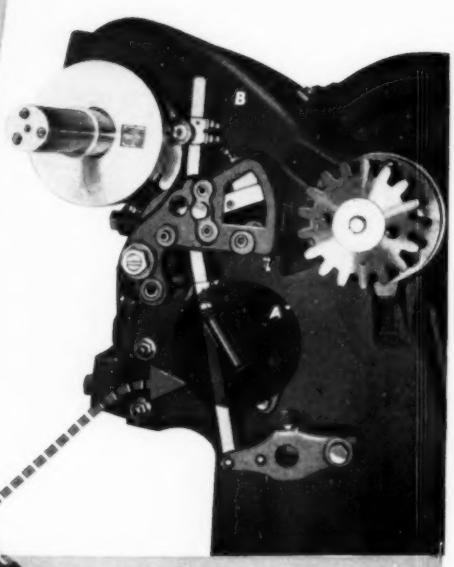
American Machinist

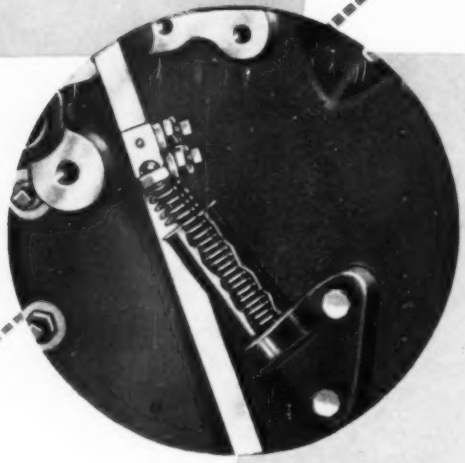
McGRAW-HILL BUILDING
NEW YORK 18, N. Y.

EXTRA SAFETY

AFFORDED ONLY BY JOHNSON *INCLINABLE* POWER PRESSES

IN your calculation of equipment costs, one of the most important considerations is SAFETY. This factor becomes part of your over-all operating picture, to be considered beyond the direct investment in particular machine units. Johnson builds into all its inclinable power presses, as an integral assembly, a patented Non-Repeating Safety Trip. This device is available on no other make of press, yet costs nothing extra. If you think SAFETY FIRST, you'll think first of JOHNSON.





Uncovered by removing the flywheel, the Johnson Safety Tripping mechanism is pictured above in engaged position, the trip pedal depressed, the activating springs at (A) ready to expand and lift the release lever and roller to upper position, awaiting the next cycle. Note two activating springs. If one fails, the other takes over. Should both break, the clutch automatically disengages. Replacement of springs can be made in 30 seconds, without stopping machine or removing parts other than those to be replaced.

Phantom view of pedal spring guide tube above reveals simplicity of Johnson Safety Trip activation. This mechanism is for single stroke operation. For continuous automatic operation simply raise the release lever roller to (B) position. Any plant doing a variety of jobs needs the adaptability, simplicity, precision and SAFETY of Johnson Inclinable Power Presses.

MODEL No. 4½
43 Ton Capacity

Write for detailed information on seven models of open back inclinables now offered. Chances are a Johnson can do a better job for you.

Johnson MACHINE and PRESS CORP.

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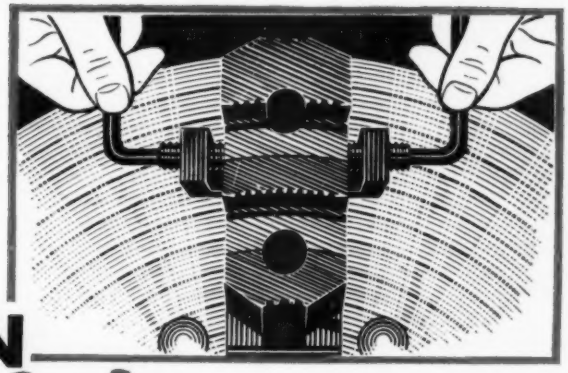
Individual Jaw Adjustment
to within .001 Concentricity



CUSHMAN *Accralock* CHUCKS

The Cushman Power Chuck has been designed to obtain the full out-put potentials of modern machine tools in repetitive production by speeding the grip and release of work holding jaws . . . reducing operator fatigue to a minimum.

In addition, the "Accralock", Cushman's exclusive device for quick and extremely accurate individual jaw adjustment assures concentricity to within .001" for safe holding of irregular work under heavy loads and feeds.

Cushman Power Chuck installations are simple, and applicable to all types of single and multiple spindle automatics, horizontal turrets and chucking machines, grinders, etc.

To answer questions on selection and application, Cushman Engineers are always ready to serve you.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

Write for CATALOG P063

CUSHMAN also manufactures a complete series of WRENCH OPERATED CHUCKS
Write for Catalog 63 and Bulletins

Consult CUSHMAN

Chucking Engineers Since 1862

New FLEX-a-FOAM Filter Mask

Dust Protection Your Workers Welcome and WEAR

In safety circles everywhere Flex-a-Foam Filter Masks are making news, because here for the first time is a respirator that workers really welcome and wear—without the usual prodding from supervision. Look at these unusual features:

1. **It's light and easy to wear—weighs only 1 ounce, fits any size face with comfortable snugness.**
2. **It's *easier* to breathe and talk through than an ordinary linen handkerchief.**
3. **Its exclusive method of headband adjustment keeps mask snug and comfortable—without tension or hair pulling.**
4. **It's so smartly styled that workers don't look or feel peculiar, and are no longer the brunt of jokes.**
5. **It's low in cost, low in upkeep—easy to clean and keep clean.**

FLEX-a-FOAM'S filter is a honeycomb of whipped foam latex that *keeps out non-toxic nuisance dusts as small as 1/25000 of an inch.* Positive-locking molded plastic frames are so flexible they adjust themselves to every wearer's facial contours, yet so tough they're unbreakable in normal usage.

For the utmost in comfort, efficiency and economy, treat your workers to Flex-a-Foam Filter Masks—lowest priced *quality* respirator ever made.

Attention Agents and Jobbers
Your interest is invited

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Cleveland 13, Ohio
Please send full information and prices on Flex-a-Foam Filter Masks.

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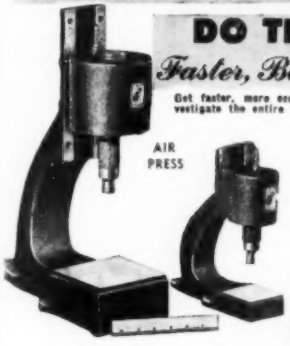

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Get faster, more economical production set-ups—investigate the entire "family" of Mead Air-Operated devices. Do you want to move things—lift them, slide them, tilt them—or hold them firmly? Mead Air Power will do it. Do you need a delicate flexible touch—or tremendous power? Mead Air Power has both.

AIR PRESS

FACE MOUNTED CYLINDER

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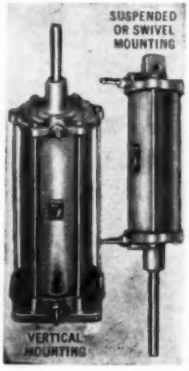

SUSPENDED OR SWIVEL MOUNTING

VERTICAL MOUNTING

CATALOG READY

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

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MEAD SPECIALTIES CO.
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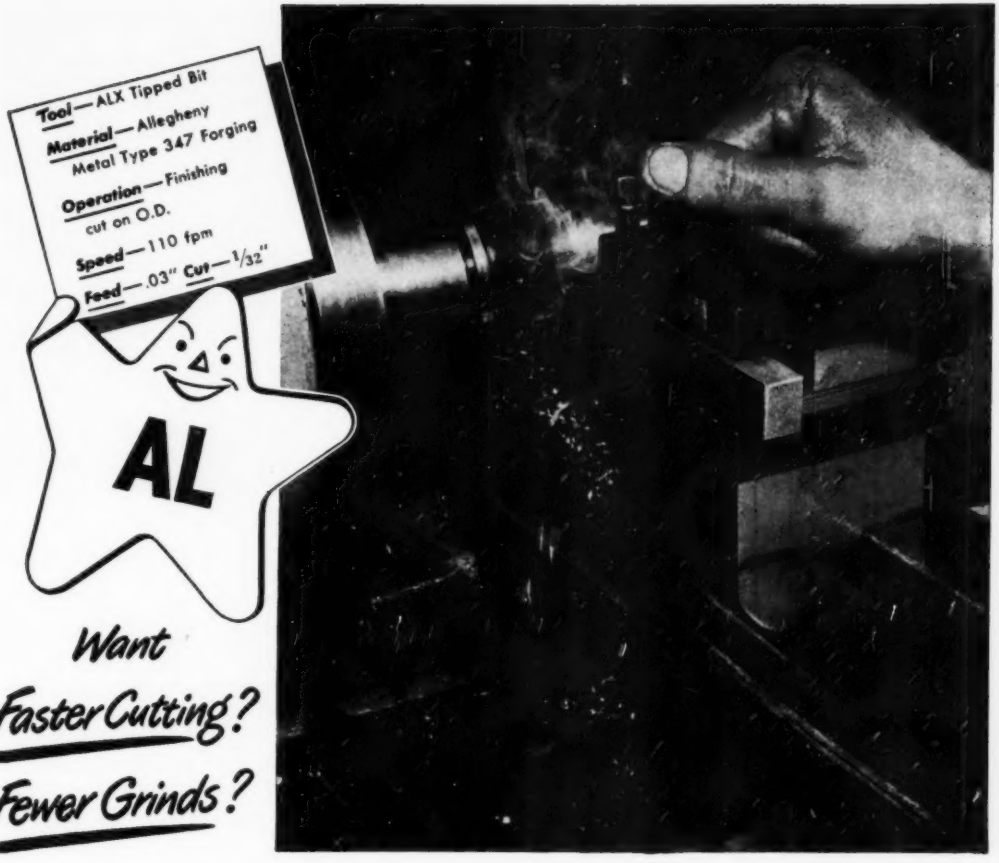
Besides the standard, ready-made fixtures for the application of Air Power (such as the Air Press Air Vise, Air Chuck, Air Clamp) Mead offers a wide selection of air cylinders which can be used in special jigs and fixtures. Illustrations show four types of double-acting cylinders which can be furnished in five different bores with optional lengths of stroke.



Want Faster Cutting? Fewer Grinds?

...then get ALX CAST CUTTING ALLOY

Write for copy of

"ALX ALLOY TOOL BITS"

An eight-page booklet tells how you can effect production economies by using ALX for fast turning, boring, and facing—in certain applications. Helpful information includes grinding, tool angles, speeds and feeds, brazing of tips. *Write for your copy.*

ADDRESS DEPT. AM-89

Many a machine shop—and probably yours—has jobs on which ALX Tipped Tools or ALX Solid Bits step up production by permitting increased speeds, feeds, and depths of cut. Resharpening is less frequent, the reason being special composition.

ALX is a cast-to-shape, non-ferrous, cobalt-base alloy containing chromium, tungsten, carbon, and boron. The as-cast hardness of 60-62 Rockwell C obviates later heat treatment. Tools stay sharp at accelerated speeds and higher temperatures. Speed range is above that of high-speed steel, but lower than with carbide. At such intermediate speeds, the superior performance of ALX results from toughness, red-hardness, edge-strength, and abrasion-resistance values combined.

An Allegheny Ludlum tool engineer can quickly point out the strategic spots to tool up with ALX. For this service, call A-L.

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Forging and Casting Division

DETROIT 20, MICHIGAN

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GUN IRON PISTON RINGS

DOUBLE SEALING ACTION DOES THE WORK OF 2 RINGS

Outlast OTHER RINGS *8 times*

...and still going!

A railroad company installed Hunt-Spiller double-acting piston rings in each of four pistons in a steam operated air pump (2 pistons for steam – 2 for air). Piston rings were normally replaced every nine to twelve months but the Hunt-Spiller rings, of Gun Iron, are still going strong after eight years. Gun Iron is performing equally well in other types of Hunt-Spiller rings for hundreds of different uses.

What is
GUN IRON?

You'll find all the answers as well as valuable information on other metals and alloys in this interesting metallurgical bulletin. Write for it on your company letterhead. No obligation, of course.

Wherever cast parts must withstand frictional wear, high heat, pressure or impact, Gun Iron excels. During the past 139 years its resistance to these conditions has been proven on thousands of applications in the railroad, marine, diesel, petroleum and metalworking fields. In addition, Gun Iron castings can be relied upon for uniform performance because their physical properties are completely controlled at Hunt-Spiller . . . Gun Iron, and its alloys, are produced in our own air furnaces, cast in our own foundry and when desired, can be completely machined in our manufacturing plant.

If you have cast wearing parts in your product, it will pay you to investigate Gun Iron. Our engineers stand ready to assist you in its application . . . our plant facilities are geared to produce your parts, from raw material to finished part, both accurately and economically.

DESCRIPTIVE BULLETIN AVAILABLE ON H-S DOUBLE-ACTING PISTON RINGS

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MANUFACTURING CORPORATION

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Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.

THE *chips* TELL ANTISEP'S STORY

One look at the two samples of machined chips pictured above, and you will see why Antisep All-Purpose Base was chosen for use in many machines, including automatic screw machines.

This comparative machining of SAE 1045 steel was done on the same automatic, the only variable being the cutting fluid itself and the increased speed Antisep permitted. Examine the chips, then read the facts at the right, and you will understand why this particular plant — and so many others — have standardized on Antisep All-Purpose Base.

It's miscible with either water or oil; high in saponifiable and sulphur; can be used for 90% of your cutting or drawing needs; costs only about 7c a gallon as diluted. For more facts, write for illustrated leaflet, or better yet, tell us you want to try Antisep A. P. Base on a comparative basis, in your own shop.

HERE'S DETAILED PROOF

	Former Coolant	*Antisep A. P. Base*
Dilution	1:10	1:30
Speed	200 RPM*	300 RPM
Feed	120 FPM	180 FPM
Time per piece	60 sec.	37 sec.

* *Above this speed, machine chattered—but not with Antisep.*

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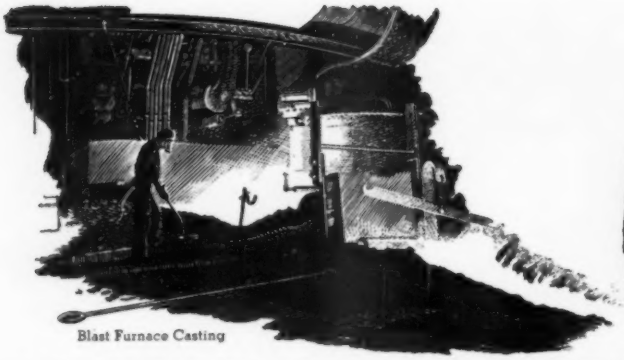
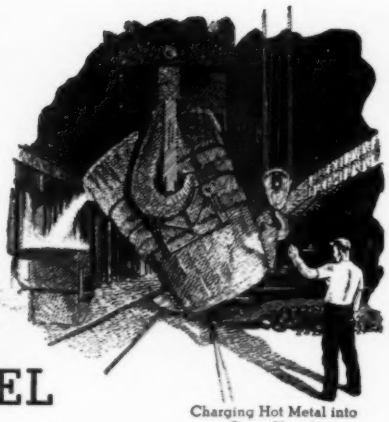


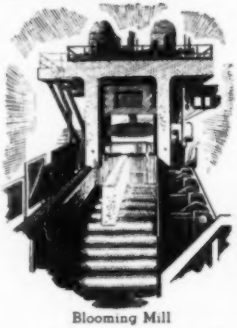
Blast Furnace Casting



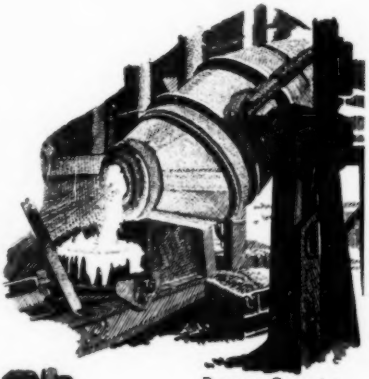
Charging Hot Metal into Open Hearth

AS GOOD AS THE STEEL from which they are drawn

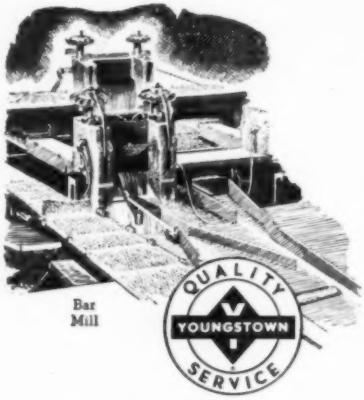
THE experience of nearly 50 years in producing Youngstown Steel in grades and analyses to meet our customers' most exacting requirements is your best insurance of the high quality of Youngstown Cold Finished Bars.



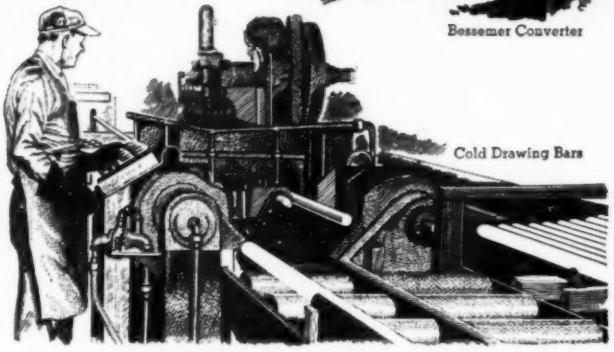
Blooming Mill



Bessemer Converter



Bar Mill



Cold Drawing Bars

Youngstown

COLD FINISHED CARBON AND ALLOY STEEL BARS

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items are applicable. Townsend engineers will be glad to help reduce

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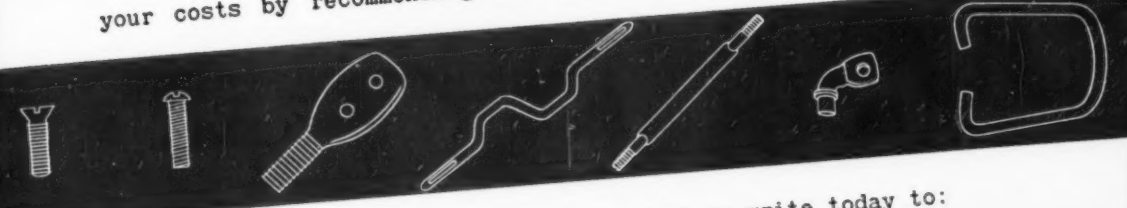

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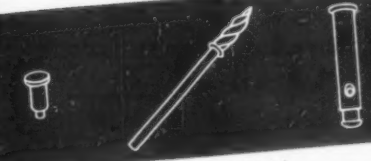

(Parts shown one-half size)

Townsend

COMPANY — ESTABLISHED 1816

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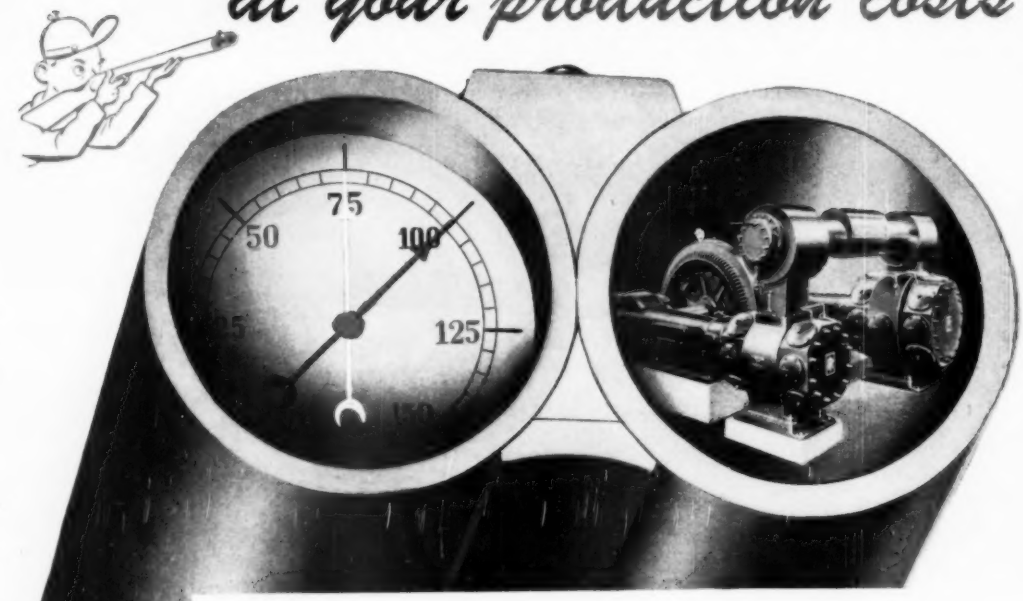
Fire this DOUBLE BARREL *at your production costs*



1 FULL AIR PRESSURE

Many plants are choking their production and their profits by operating Air Tools on insufficient air pressure. A seemingly small pressure drop of 10 pounds per square inch may cut a tool's productive power as much as 15 to 25%.

Industry is installing new and more Air Tools to reduce its production costs. Why not give these Air Tools a chance to give maximum performance? An I-R engineer will help you make a pressure check . . . at the tools. If it's low, perhaps just a change of piping will correct it . . . larger pipe, or more direct, or new feeder lines. Or possibly you may need more compressor capacity. . . at the main plant or at booster stations.

2 MODERN COMPRESSORS

If you need a new compressor, you will want the *best*. Ingersoll-Rand's "PRE" synchronous-motor-driven compressor (shown above) is the kind of machine that any plant engineer would be happy to operate . . . any company proud to own. These compressors are full of valuable features that you cannot buy in any other compressor . . . features that save power, save maintenance. You can't afford to over-look the "PRE" in any modernization program.

"PRE" sizes range from 400 to 3000 horsepower, and if you need smaller compressors, or another type of drive, Ingersoll-Rand has it . . . whatever it is.

Ingersoll-Rand also builds a full line of Air Tools, Air Hoists, and Rock Drills for both production and maintenance work. And remember, Air-Power equipment pays for itself nearly twice as fast today.

AIR POWER ... The Key to Lower Production Costs

Ingersoll-Rand

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WHEN THERE'S HARD WORK AHEAD FOR STEEL PARTS
...use *Republic* Cold Drawn Alloy Steel Bars

When steel parts must carry heavy loads—or withstand severe shock and strain—or resist abrasion resulting from high speed or continuous use—you probably can keep equipment in use longer and *cut maintenance and replacement costs* by using Republic Cold Drawn Alloy Steel Bars.

Republic Alloy Steels are exceptionally high in strength and toughness. They respond uniformly to hardening treatment. In cold drawn bar form, they provide the close tolerance, accuracy of section, fine surface finish and UNIFORM MACHINABILITY characteristic of Union Cold Drawn Products. Thus, they further add to economy by helping to cut parts production costs.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, furnace treated as you require—annealed, normalized, heat treated, spheroidized, stress relieved or carbon corrected.

Republic metallurgists are ready *now* to help you get the results you need. Write for further information.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
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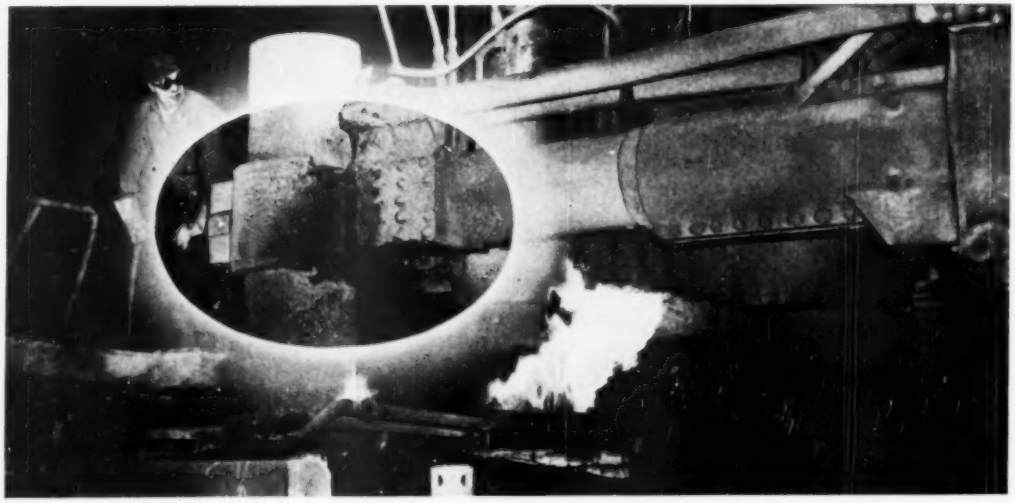
Republic COLD DRAWN
ALLOY STEEL BARS

REPUBLIC STEEL

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

How Tough Can a *High Conductivity* Casting Be?



MALLORY 3* METAL
Can Give You The Answer!

When you need *outstanding* physical properties in a casting for high conductivity applications, *Mallory 3 is your answer.* Special heat treatment gives Mallory 3 physical properties superior to those normally encountered in cast brasses and bronzes for high conductivity applications.

Mallory 3 is one of a series of special alloys developed by Mallory to meet industry's demand for materials with special physical properties, and it is available in cast form. Mallory engineers will advise you on your particular problem. Just let us know the physical requirements of your application.

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New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 BENDING MACHINES—*Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago 14, Ill.* 40-page catalog No. 49 is profusely illustrated and describes the company's line of hydraulic, hand-operated, and special bending machines, shears and cutters, and fabricating tools for tubing. Illustrations of sample bends and special bending machines for specific uses are also given.

2 MULTIPLE SPINDLE MACHINES —*The National Acme Co., 170 E. 131st St., Cleveland 8, Ohio.* 44-page bulletin TP-44 describes tooling practices actually used on 44 different bar-machine setups in plants using this company's machines. Each page deals with performance facts and is a record of a job as originally tooled.

3 LATHES—*The Monarch Machine Co. Sidney, Ohio.* Two attractive pamphlets illustrate and describe two of the company's new lathes. The first, a 15-page booklet, provides a general description and illustrations of the operation of the company's latest form-turning machine. The other is an 11-page brochure describing the Monarch roll-turning lathe. Specifications and performance data are included in both.

4 BENDING BRAKES—*Dreis & Krump Mfg. Co., Loomis Blvd., at 74th St., Chicago, Ill.* 7-page bulletin P-49 describes five steel power bending brakes. A two-page table provides complete size and specification data on the machines.

5 LATHE—*The Sidney Machine Tool Co., Sidney, Ohio.* 7-page folder provides a thoroughly illustrated description of a 32-in. heavy-duty lathe. Complete engineering data is given.

6 HELICAL GEAR DRIVES — *Foote Bros. Gear & Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill.* 18-page engineering manual MPA covers the line of Maxi-Power inclosed helical-gear drives in single-, double-, and triple-reduction types. Service factors, load characteristics and six pages of data on dimensions and ratings are provided.

7 COLLET CHUCKS—*Sutton Tool Co., Sturgis, Mich.* This 8½- x 11-in., two-color booklet illustrates and describes the Porst line of Levermatic and Handimatic collet chucks. Operating ideas and hints are given and attachments and accessories for different machines are listed.

8 PRESSES—*Clearing Machine Corp., 6499 W. 65 St., Chicago 38, Ill.* 8-page, two-color catalog No. 211 presents company's line of open-back inclinable presses. Swing-key clutch, pneumatic friction clutch and accessories are described. Presses are built from 30- to 75-ton capacity.

9 SHEARS—*Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo 11, N. Y.* 12-page bulletin 80F-A describes, illustrates, and gives specifications of foot shears ranging in capacity from 22-in. to 10-ft. cutting length. The last two pages are devoted to cutting gages which are standard equipment on the company's machines.

10 BORING MACHINES, LATHES, PRESSES—*American Steel Foundries, King Machine Tool Div., Cincinnati 29, Ohio.* Series of two-color catalogs provide illustrated descriptions and technical data on vertical boring and turning machines, geared head lathes, and hydraulic presses. Catalogs K1, K2, K3 and K4 cover boring and turning machines ranging in size from 30 to 144 in. Catalogs S-1 and S-101 cover lathes, and 12-page bulletin No. 1010-B describes hydraulic metal-working presses.

11 CARBIDE DIES—*Lincoln Park Industries Inc., Lincoln Park 25, Mich.* 10-page brochure presents six separate case studies showing how carbide dies increase production, reduce costs, and improve quality. Included are a description of this company's die-making facilities and illustrations of a variety of products that can be made more economically with carbide dies.

12 CUTTING MACHINE — *Industrial Devices Corp., Detroit 2, Mich.* 3-page folder presents an all-purpose cutting machine for circle and shape cutting, beading, rigidizing, forming, and flanging. Illustrations of some of these operations are shown and the 12 main features of the machine are given.

13 SECOND HAND MACHINES—*J. L. Lucas & Son, Inc., Bridgeport 5, Conn.* 4-page folder lists 101 available second-hand machines. Included are lathes, milling machines, grinders, rolling mills, screw machines, shapers, nut and bolt equipment, and boring machines.

TOOLS AND ACCESSORIES

14 SPEED REDUCERS—*Euclid Universal Machine Co., Cleveland 10, Ohio.* 28-page bound catalog presents the company's line of speed reducers, including descriptions, technical data, and selection charts. Graphs of rpm input versus torque output and maximum input hp. are presented.

15 BUSHINGS AND LINERS—*Colonial Bushings Inc., P.O. Box 37, Harper Station, Detroit 13, Mich.* Printed on extra-heavy stock to withstand continual usage, quick reference catalog No. B-649 presents vital dimensions and information on any standard drill jig bushings or liner. Information on how to order both standard and special bushings, material specifications and grinding stock allowed are given.

16 CUTTERS—*Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.* 4-page circular describes thread-milling cutters. Specifications, sizes, and prices are given. Also available is a four-page circular on the Series M flexible-shaft rotary machines for burring, filing, sanding, grinding, wire brushing, or polishing.

17 GRINDING GAGES—*Federal Products Corp., 1144 Eddy St., Providence 1, R. I.* 11-page pamphlet is devoted to comprehensive description of grinding gages for controlling dimensions of straight, tapered, or splined diameters, between- or over-shoulders width, multiple diameters, and widths. Applications are illustrated and described.

18 CUTTING BLADES—*Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Detroit 20, Mich.* 8-page catalog illustrates and lists dimensions, general uses, and prices of a variety of solid carbide blades for milling cutters.

19 PORTABLE POWER TOOLS—*Independent Pneumatic Tool Co., 175 State St., Aurora, Ill.* Catalog E-2 covers an entire universal electric portable power-tool line giving complete data including prices. Circular No. JE-1131 on the Thor Silver Line 4½-in. universal electric belt sander is also available.

20 SPRING TESTER—*Baldwin Locomotive Works, Testing Equipment Dept., Phila., 42, Pa.* 4-page illustrated bulletin No. 302 describes a spring tester and lists its applications. This instrument is applicable to any type of small springs for loads up to 5 lb. and lengths up to 12 in. at specified load.

21 TOOLS—*Carboloy Co. Inc., Detroit 32, Mich.* 16-page supplement No. 10 to Carboloy Catalog GT-200 provides order numbers, dimensions, and prices of a wide variety of cemented carbide tools. Suggested applications are given and authorized distributors are listed.

22 RADIANT GAS HEATING—*Selas Corp. of America, Erie Ave., and D St., Philadelphia 43, Pa.* 8-page bulletin entitled "Heat Processing Machine for Forging and Bending" discusses radiant gas heating rates of from 1 to 5 min. per thickness

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Title Supt.
Company W.C. Dow Mfg. Co.
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1. If you are requesting four pieces or less, please use only the bottom card.
2. Be sure to fill one space for each booklet.
3. When you have filled out one card, detach, stamp and mail.

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FREE LITERATURE

inch of steel and consequent metallurgical advantages of faster metal flow and reduced scale formation.

23 DRY CYANIDING—*Surface Combustion Corp., Toledo 1, Ohio.* 4-page folder SC-145 explains the applications of dry cyaniding processed to the operation of continuous and batch-type industrial furnaces. Production advantages over conventional methods are presented.

24 OPTICAL PYROMETER—*Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.* 16-page bulletin N-33D illustrates and discusses both the plant and laboratory applications of this potentiometer-type optical pyrometer. Two pages are devoted to a large, labeled, illustration of the unit.

25 SURFACE BURNERS — *Surface Combustion Corp., Toledo 1, Ohio.* 4-page, 2-color bulletin SC-142 shows applications of surface burners to typical immersion heating installations. Both suction- and atmospheric-type burners are described and applications to which they are adaptable are discussed.

26 WELDING — *Metallizing Co. of America, 3520 W. Carroll St., Chicago, Ill.* 6-page bulletin provides a comprehensive discussion of the dot-welding process, and its importance in foundries, machine shops, salvage, and motor block repair shops. Descriptions of equipment and costs are given.

27 OXYACETYLENE CUTTING—*Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.* Oxyacetylene machine gas-cutting slide chart gives oxygen and acetylene pressures, cutting speed in in. per min., gas consumption and approximate width of kerf for a given cutting tip. Cleaning drill sizes are also indicated on the pocket size chart.

28 WELDING—*The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y.* 36-page booklet called "Unionmelt Apparatus Catalog" contains latest information on Unionmelt apparatus and supplies for submerged melt welding. Photographs of typical installations show scope of work that can be done with each type of apparatus.

29 RADIANT TUBE HEATING—*Holcroft and Co., 6545 Epworth Blvd., Detroit 10, Mich.* 8-page illustrated bulletin on radiant-tube heating of controlled-atmosphere heat-treat furnaces, discusses the development and design of radiant tubes and the advantages provided by this heating method for controlled atmosphere furnaces.

PLANT SERVICE EQUIPMENT

30 MATERIALS HANDLING—*Market Forge Co., 25 Garvey St., Everett, 49, Mass.* 32-page catalog No. 1201MH provides detailed specifications and prices of all forms of running gear, trucks, and other materials handling equipment. Over 40 specialized units for handling materials are also covered in the illustrated booklet.

31 MARKERS—*Weston Lithograph Co., 600 E. Second St., Los Angeles 54, Calif.* 12-page bulletin 349 presents and illustrates use of company's line of markers for terminals, wires, cables, conduits and pipes.

32 PRIMERS—*The Industrial Finishes Dept., Atlas Powder Co., Stamford, Conn.* Folder describes the Atlas line of Zapon primers and primer surfaces. Properties of the materials are listed in chart form with recommendations for particular types of surfaces and end uses.

33 COMPRESSORS—*The Wayne Pump Co., Fort Wayne 4, Ind.* 20-page bound booklet entitled "The Strange Case of the Air that Isn't There" treats, in a light vein, the problem of buying compressors with the proper capacity for given jobs. Two pages are devoted to a table listing horsepower capacity and efficiency of various models operating at pressures between 140 and 175 psi.

34 STORAGE — *The Frick-Gallagher Mfg. Co., 401 Shubert Bldg., Philadelphia 2, Pa.* 4-page illustrated pamphlet covers various types of divided rotary bins and straight steel shelving for a variety of industrial needs.

35 RUST PREVENTIVES — *E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.* 8-page booklet thoroughly describes and lists recommended uses for each of the 11 Rust Veto products developed by this company. A full-page chart outlines the physical properties, thickness, type of film, and amount of coverage, obtained.

36 CASTERS—*The Bassick Co., Bridgeport, Conn.* 8-page folder gives latest information on this Company's "V" grooved-wheel casters for angle-iron tracks. Illustrations, machine drawings, and tables of specifications are included.

37 STAMPS—*M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 3, Pa.* 6-page folder includes reproductions and listings of company's standard date-coding and piece-work symbols, code symbols, and combination stamps. Standard stamp sizes are also given.

PARTS AND MATERIALS

38 COMPARATOR CHARTS—*Jones & Lamson Machine Co., Springfield, Vt.* 17-page catalog illustrates and describes radius, grid, protractor, screw-thread, and standard inspection charts for optical comparators. Also included are chart rails, glass scales, blank drawing charts, combination holders for charts and photographs and illustrations of some of the comparators.

39 GEARS—*Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill.* Two booklets cover the design and production of gears. 15-page booklet No. A-28 entitled "Design of Gear Teeth" measures 8½ x 11 in. and illustrates and explains the design of gear teeth. 17-page AD-4 entitled "Faster Gear Production" is a 5¾ x 8½-in. booklet covering the production of gear teeth.

40 NON-FERROUS ALLOYS — *The Riverside Metal Co., Riverside, N. J.* 44-page pocket-size ordering guide lists the advantages, application, composition, forms, properties, and manufacturing limits of this company's phosphor-bronze, nickel-silver, cupro-nickel, beryllium-copper and special alloys. A special section on heat treatment of beryllium copper is included.

41 PARTS—*Universal Engineering Co., Frankenmuth, Mich.* 16-page catalog B-1018, provides cross-section drawings and specification tables on drill bushings, locating pins and retainers, lock screws, and clamps. Also available is an 8-page net price list and condensed data sheet of ASA standard drill jig bushings, locating pins and retainers, lock screws, clamps and locating jigs.

42 STRIP STEELS—*Precision Steel Warehouse Inc., 4409-25 W. Kinzie St., Chicago 24, Ill.* 98-page catalog No. 50 is a stock list complete with engineering data on this company's strip steels, spring steels, and toolroom specialties. Considerable space is devoted to tables of pounds per linear foot, for various sizes of cold-rolled strip steel.

43 AIR VALVES—*The Bellows Co., 222 W. Market St., Akron, Ohio.* 12-page bulletin AV-100 provides descriptive drawings, dimensions, and illustrations of company's line of 2-, 3-, and 4-way valves for remote control of standard air cylinders.

44 FASTENERS—*South Chester Corp., Finance Bldg., Philadelphia 2, Pa.* 28-page manual features full descriptive and engineering data on a broad range of Southco blind rivets, anchor nuts, panel fasteners, door-retaining springs, and various newly-developed items.

45 CYLINDER ASSEMBLIES — *Hydraulic Equipment Co., 1100 E. 222 St., Cleveland 17, Ohio.* 4-page illustrated folder on standard design, single-and double-acting cylinder assemblies recommends operating pressure, effective diameter and other information for various operations. Also available is a two-page folder listing physical properties and presenting facts about hydraulic oils.

46 ELECTRONIC CONTROL — *Photoswitch Inc., 77 Broadway, Cambridge 42, Mass.* 65-page booklet entitled "Cutting Production Costs with Electronic Controls" presents 45 case studies describing actual examples of cost-saving production techniques. Each case study describes an industrial control problem which has been solved through the use of electronics.

MISCELLANEOUS

47 CASTINGS—*Howard Foundry Co., 1100 N. Kostner Ave., Chicago 39, Ill.* 72-page, two-color book contains helpful, understandable, information and illustrations on casting of aluminum, magnesium, brass, bronze, and semi-steel. Numerous tables of mechanical properties, chemical analysis and physical characteristics of these metals is included. The book contains a section on the fabrication of magnesium-zirconium alloys for jet and turbine engine parts.

48 PAINTING—*Gray Co., Inc., Minneapolis 13, Minn.* 6-page folder describes and illustrates uses for the Paintmaster air-operated paint-supply pump, that pumps finished materials directly from original containers.

49 COPPER ABRASIVES — *American Wheelabrator & Equipment Corp., 717 S. Byrkit St., Mishawaka, Ind.* 4-page bulletin No. 69 lists the advantages of copper shot in cleaning and finishing brass and other non-ferrous castings. Performance results are also enumerated.

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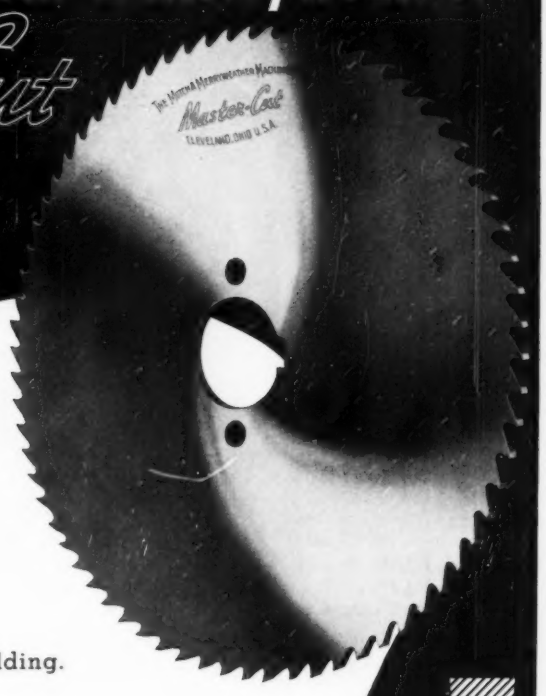

The *new* Master-Cut Blade, made of high speed steel, offers you definite advantages which pay out handsomely. The proper rake angle enables the teeth to cut ferrous or non-ferrous materials faster. Uniform side clearance avoids binding and friction. M. & M. Dual Drive Adaptors lengthen life and eliminate breakage. Our distinctive *flat hub,* thinner than the cutting edge, makes for rigid holding.

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M. & M. Master-Cut slitting blades are available in diameters of 3" to 8" and standard thicknesses of 1/32" to 3/16". Also, we manufacture the well known Triple-Chip segmental and solid circular saw blades. Complete literature upon request.

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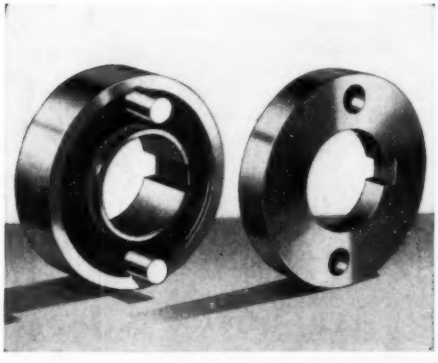

Motch & Merryweather Dual Drive Adaptors allow the same blade to be used on a range of arbor sizes. The adaptor is keyed to the arbor to provide ample driving power.

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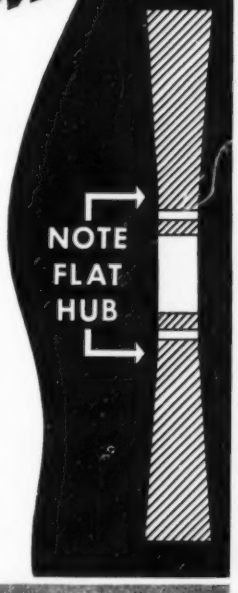

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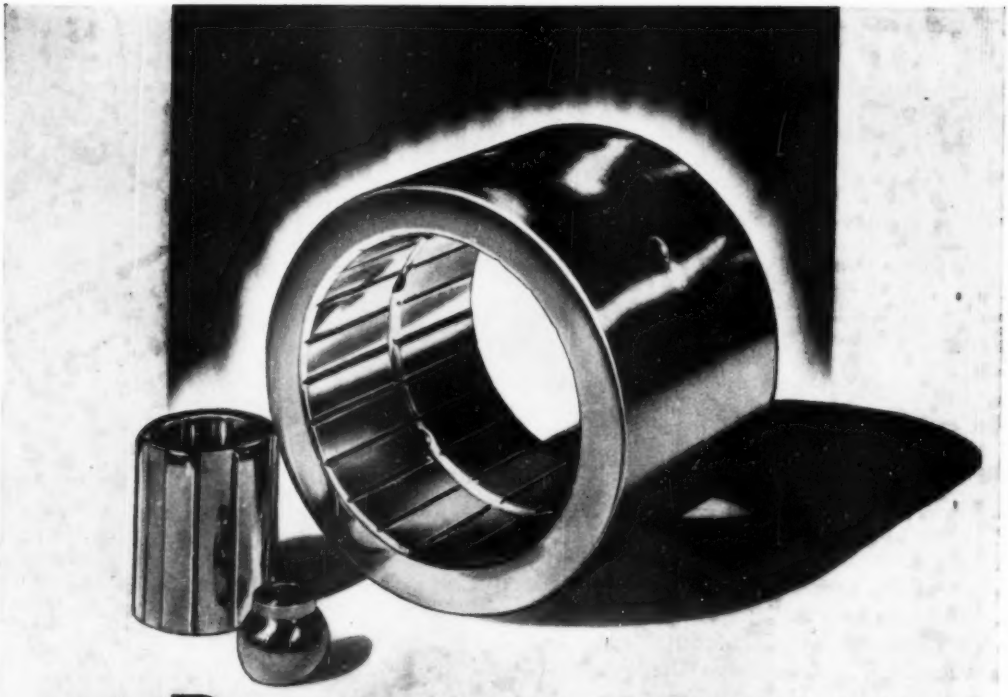

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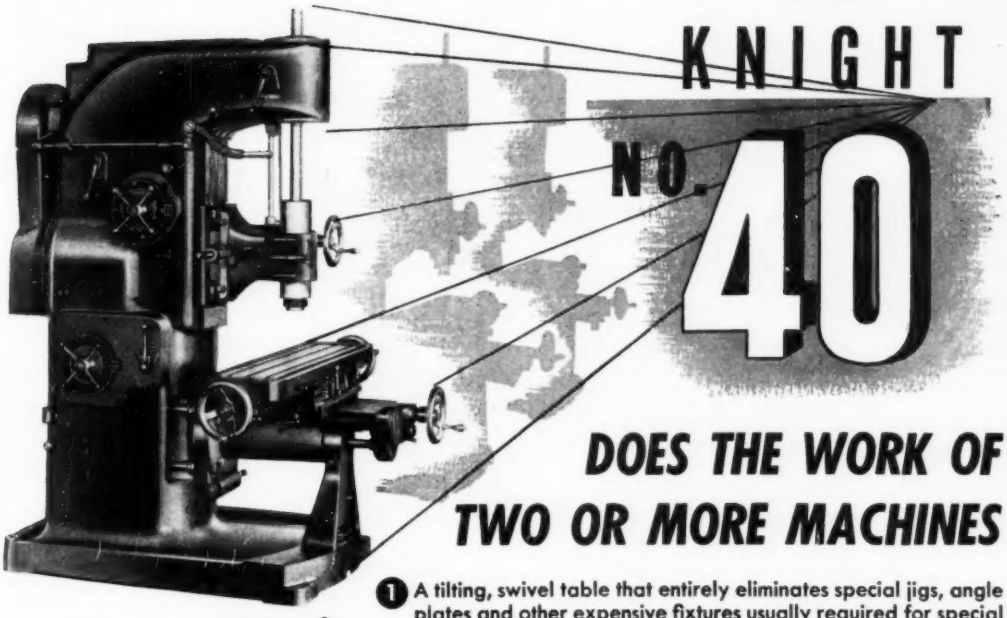

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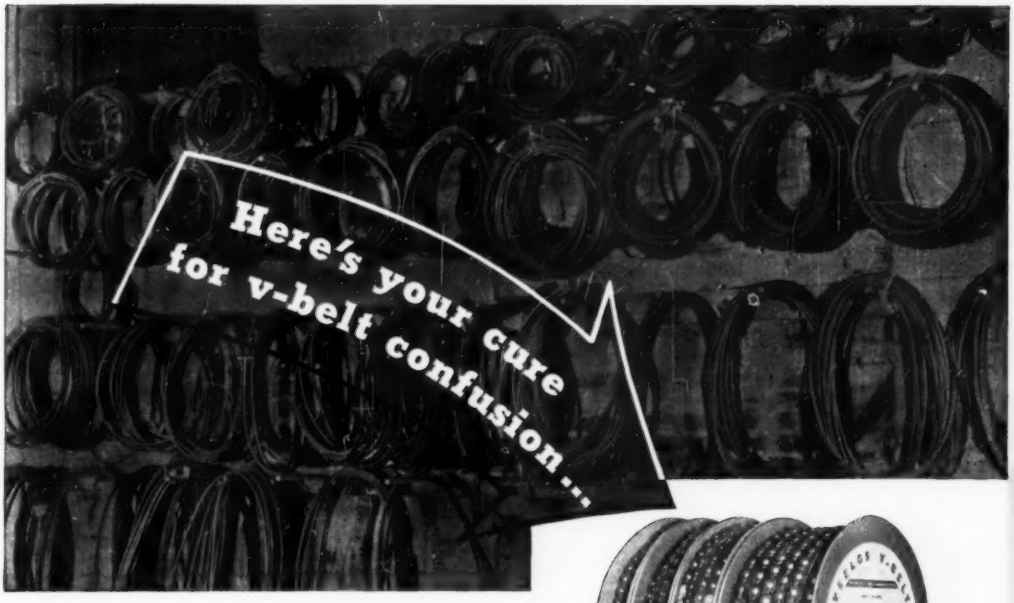

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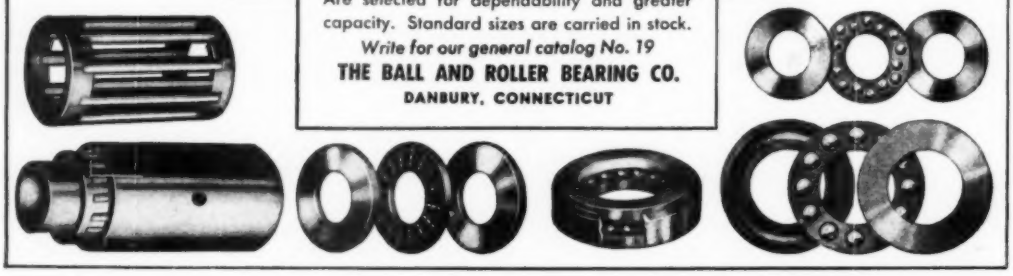

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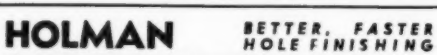

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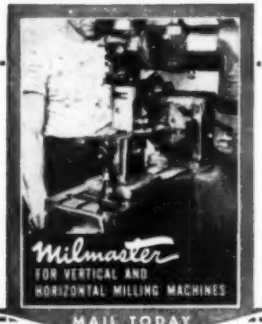

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Parco Cleaners are specially formulated to clean and condition metal surfaces for the next step in the finishing operation, to reduce cleaning time, operating temperatures and concentration of cleaner used. Surface area cleaned per pound of cleaner material is the basis of cost comparison of metal cleaning.

Try a Parco *Formulated* Cleaner. See if it doesn't save money for you, too.

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FREE Write to Oakite Products, Inc., 24 Thames St., New York 6, N. Y., for illustrated folder F7642 which tells how CrysCoating *cuts cost 10 ways.*

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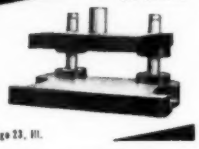

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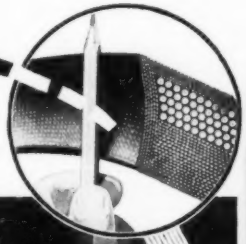
The Concave Side

(U.S. Patent No. 1813698)



SAVES Your Transmission DOLLARS

Take *any* V-belt in your hands and bend it as it bends in going around a pulley. You will see that the top of the belt, being under *tension*, grows *narrower*. The body, under compression, *widens*. The sides *bulge out*.

This shape change—in a *straight-sided* V-belt—is shown in Figures 1 and 1-A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Now look at Figures 2 and 2-A. There you see how the *same shape change* affects the V-belt built with the precisely engineered *Concave Side* (U.S. Patent No. 1813698).

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

The top of the belt narrows, the body widens. But the sides *merely straighten—and* the new shape *exactly fits* the sheave groove!

Two savings result. (1) Uniform side-wall wear *—longer life!* (2) Full side-wall grip on the pulley carries heavier loads and *sudden load increases* without slipping; saves belts, saves *power!*

The Mark of SPECIALIZED Research

The Concave Side is *MORE IMPORTANT NOW Than Ever Before*

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

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The Monthly Robertson Bulletin

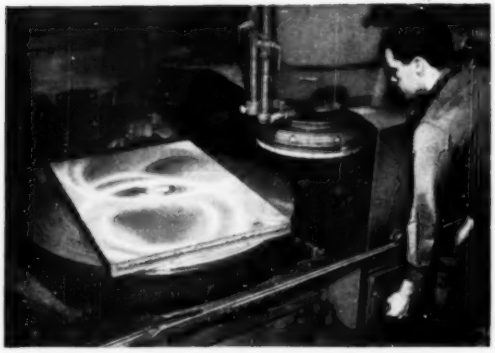
MAKE GRINDING WHEELS LAST LONGER

A grinding wheel wears out in two ways: by working or by being prepared for work.

Do the wheels you are now using demand constant dressing and redressing? Then you are wearing them out just preparing them for work. And no matter what the initial amount, your wheel costs are bound to be high. In addition, you are wasting production time. The solution to this problem is simple: specify Robertson "Cool-Cut" wheels for all your grinding operations, particularly the tough ones.

You don't wear a Robertson wheel out dressing and truing it. Remember, a Robertson is not merely a conventional wheel of extreme hardness. It's a totally *different* wheel. Its unique open structure leaves plenty of space for chip clearance, and the free-cutting qualities last much longer than with a conventional wheel.

Automatic surface grinding of hardened thrust bearings is a good example of the ability of Robertson Wheels to outlast ordinary wheels. A typical job is bearings ranging in size from



2" to 3". Average stock removal per pass is .015", with commercial finish. The longest wheel life the shop could obtain in the past was 60 to 65 hours. Switching to an 18" x 5" x 10" WA808-HV-MC Robertson Wheel, this was increased to an average of 80 hours . . . with no time lost for dressing.

Let a Robertson engineer show you how you can achieve results like this in your own shop. Write on your business letterhead for a free demonstration . . . or "blueprint" your problem and let us recommend a wheel which will solve it.

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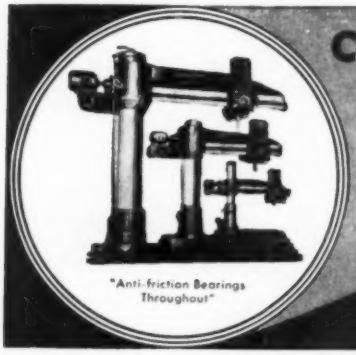

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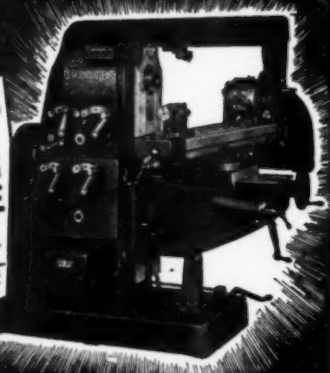

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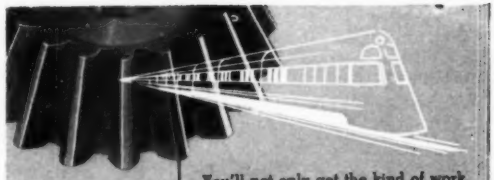

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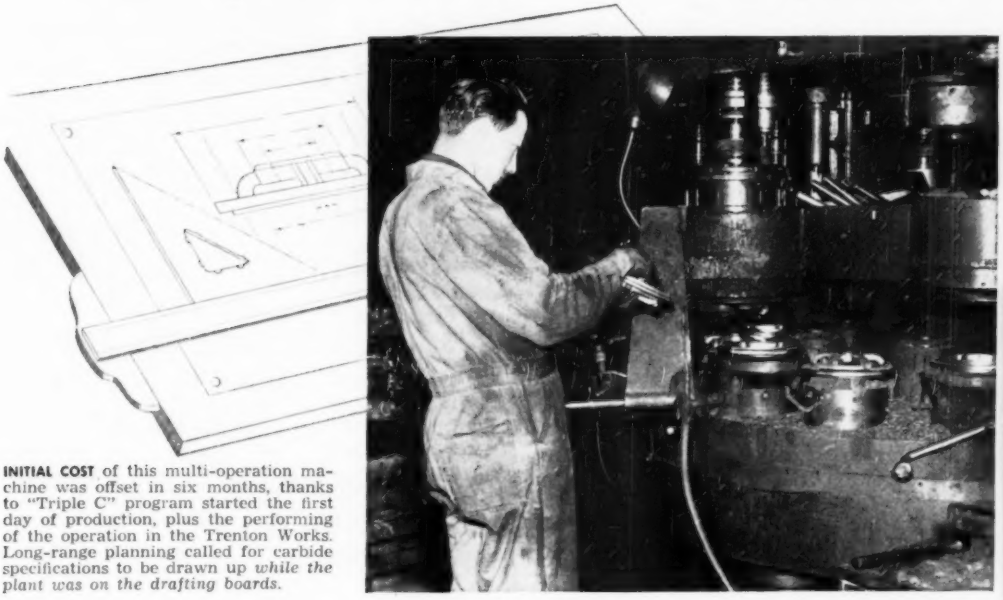
Carboloy's "Triple C" Plan starts with production at new plant



INITIAL COST of this multi-operation machine was offset in six months, thanks to "Triple C" program started the first day of production, plus the performing of the operation in the Trenton Works. Long-range planning called for carbide specifications to be drawn up *while the plant was on the drafting boards.*

95% of all machining operations at General Electric's new Trenton washing machine plant enjoy cost-saving carbide benefits through

Carboloy's "Triple C" Plan

"We couldn't operate without it!"

J. Smith, Supervisor of Planning, G-E Trenton, voiced management's opinion of Carboloy's "Triple C" in these words. G-E Trenton's supervision long realized the important part carbide control plays in quality control. Manufacturing a quality precision mechanism—the G-E washing machine—they insisted on planning for "Triple C" *while the plant was still in blueprint stage.*

This far-sighted carbide control planning is paying off, too. Tool life on many former high-speed steel machining jobs has been increased from 6 to 50 times, with piece production almost doubled in many cases.

That's not all, either

Check these other "Triple C" advantages which G-E has realized. They're all major benefits derived from a coordinated carbide control program.

- Maximum productivity per man-hour.
- Minimum machine downtime for tool changes and resetting.
- Maximum tool economy consistent with high productivity.
- Better work quality—even within tolerance and control limits.

It's never too early—or too late—to introduce "Triple C" and its benefits into your plant operations. Why not start right now? Write for Carboloy "Triple C" Plan Book GT 216, Carboloy Company, Inc., 11149 E. 8 Mile Street, Detroit 32, Michigan.

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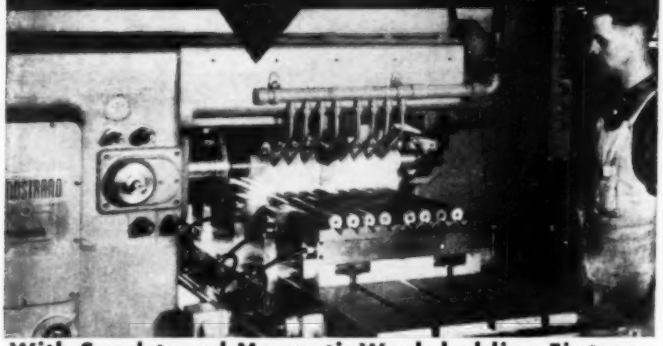

With Sundstrand Magnetic Work-holding Fixtures

Illustrated above is a magnetic fixture holding eight shafts abreast for a keyway milling operation. The job requirements called for a universal fixture capable of handling 20 different parts including straight shafts, step shafts and crankshafts. The magnetic fixture shown improved the operation and saved time and money *the five different ways indicated below* over mechanical and other means of clamping.

1 Elimination of mechanical clamps reduced the width of the fixture and made possible the use of a narrower machine table.

2 Savings were effected through the use of smaller diameter cutters due to the fact that no clearance is required over mechanical clamps.

3 The magnetic fixture made it easier to change from one size and type of parts to others. In this particular case, the parts machined include straight shafts, step shafts, and crankshafts. Twenty different parts are machined, each having from one to four keyways.

4 Loading and unloading of shafts is simplified. No clamps need to be loosened, operator merely presses a push button.

5 In the installation illustrated above, the magnetic fixture cost is approximately half that of a mechanical clamp fixture designed to handle the same range and types of parts.

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ADDITIONAL DATA

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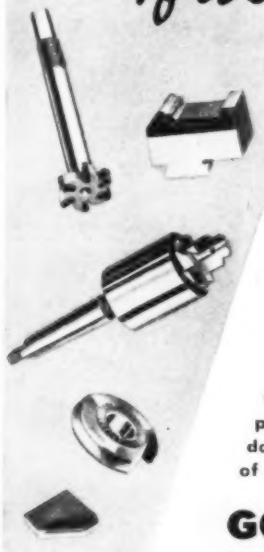

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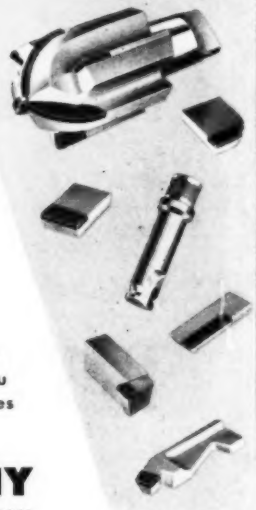

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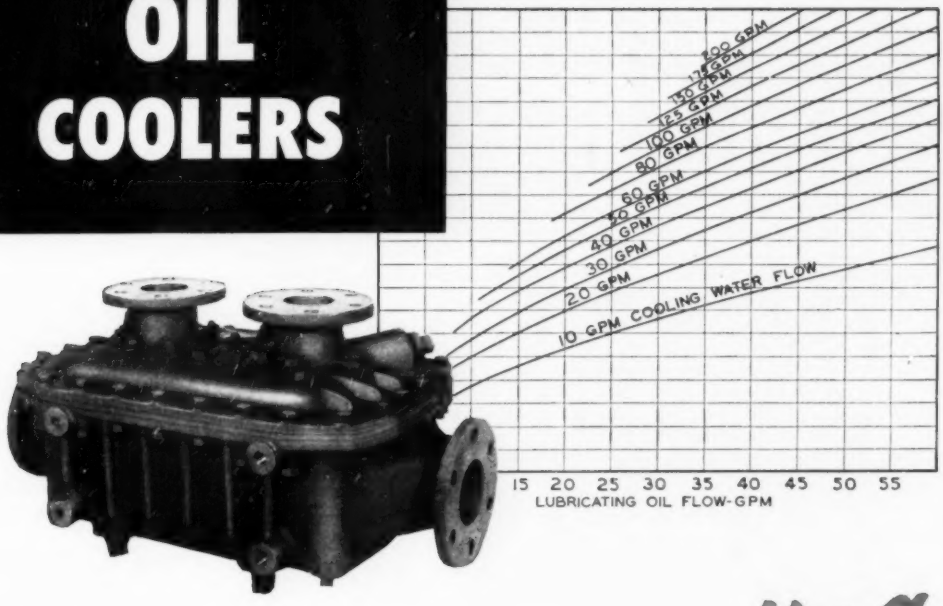

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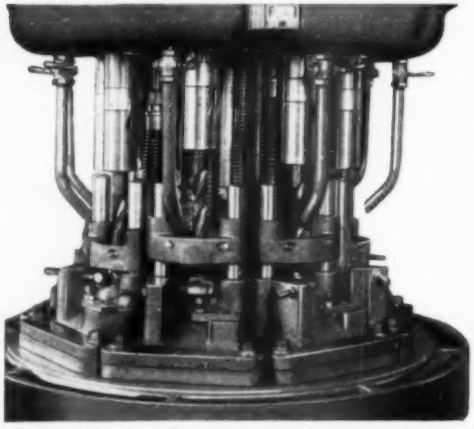

DRILLING 1" DIA. HOLE IN TWO TYPES OF PARTS AT 960 PER HOUR

Two types of bicycle handle bar stems are machined on this Model 8SV vertical drilling machine. The illustration above shows fixture design for holding both types of parts. The hole drilled is 1¼" deep, partially cored, and 1" deep. Parts are drilled at the rate of 960 per hour in a machine with a base only 6 ft. in diameter. Here's why production like this is possible:

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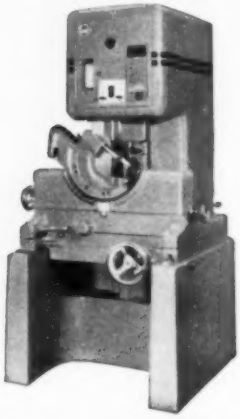

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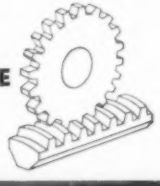

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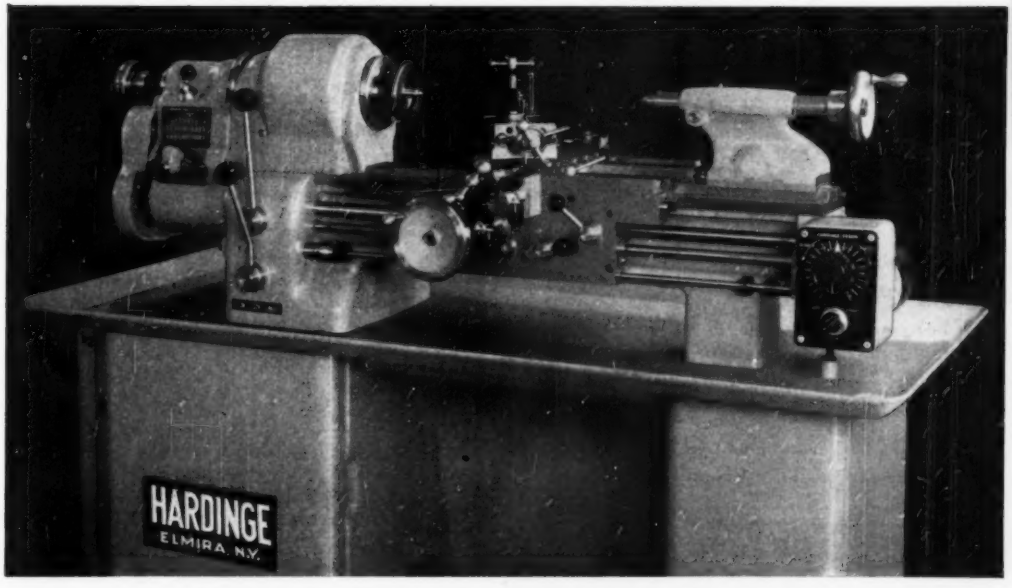

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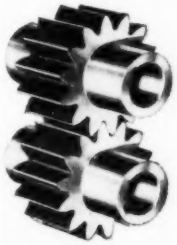

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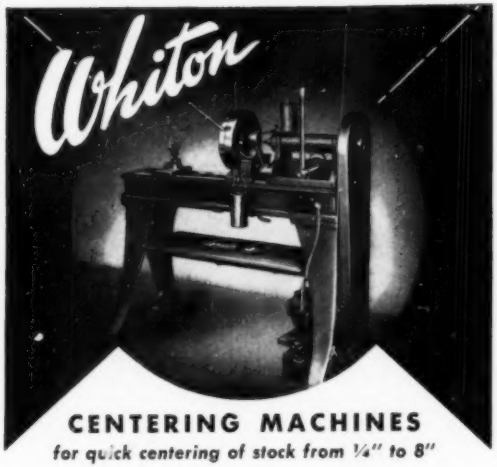

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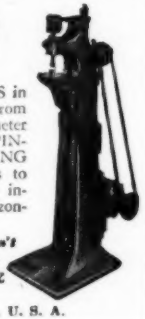

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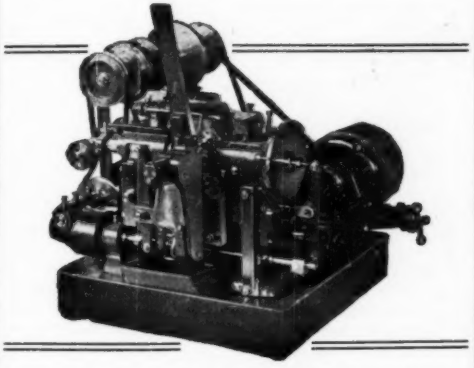

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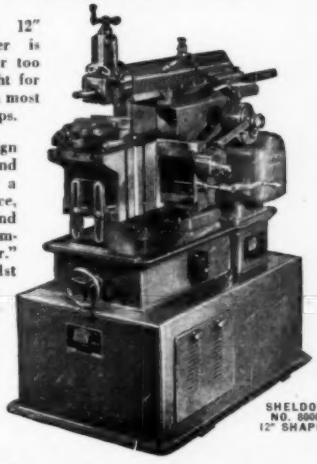

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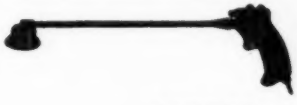

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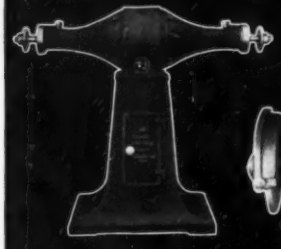

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6	1/4x1- 1/16	4.35	5.67	6	1/2x1- 1/16	6.50	8.45	6	3/4x1- 3/4	8.07	10.49
6	1/4x1- 1/8	4.35	5.67	6	1/2x1- 1/8	6.50	8.45	6	3/4x1-13/16	8.07	10.49
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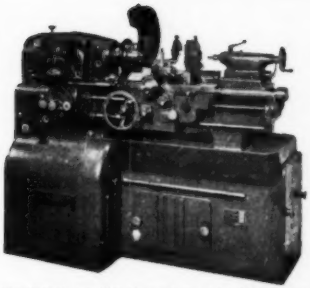

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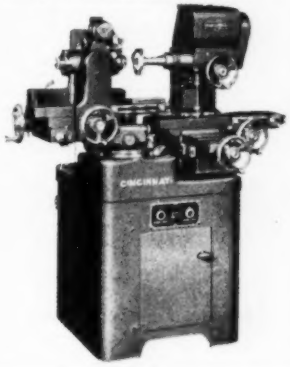

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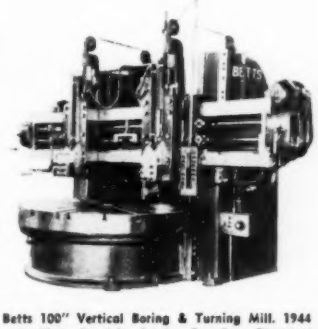

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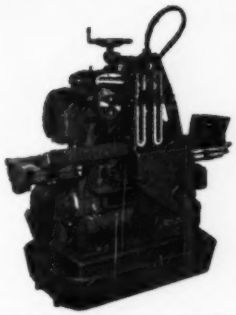

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26" Libby Type C, m.d., chucking

HORIZONTAL BORING MILLS

No. 0 Giddings & Lewis, m.d., 3½" bar
2½" Cleveland, m.d.
3½" Cincinnati-Gilbert Floor Type, m.d.
No. 25T Giddings & Lewis, m.d., 2½" bar, latest
No. 31 Lucas, 3" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
No. 45 Giddings & Lewis, m.d., 5" bar
4" bar Detrick & Harvey Floor Type, m.d.
5½" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Bullard New Era, m.d., with side head
42" Colburn, H.D., m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret head, 1 swivel head
48" Colburn H.D., m.d., 1 turret, 1 swivel head
48" Putnam, H.D., m.d., 2 swivel heads
54" Bullard Spiral Drive, m.d., with side head
54" Colburn, m.d., 1 turret, 1 swivel head
72" King, m.d., 2 swivel heads, 1 side head, latest
100" Niles Heavy, m.d., 2 swivel heads, p.r.t.
100" Niles Extra Heavy, m.d., p.r.t., late
120" Niles Heavy, m.d., 2 swivel heads, p.r.t.

SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 76 Van Norman Automatic Piston Turning and and Grinding Machine, m.d.
Arter Model A-1—8" Rotary, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard Rotary, m.d., 29" chuck
No. 22—12" Heald Rotary, m.d., latest
No. 22—12" Heald Rotary, m.d.
No. 25A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—10" Heald Rotary, belt
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt

THREAD GRINDERS

No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal Thread, m.d., latest

TOOL & CUTTER GRINDERS

No. 2 Cincinnati Universal, m.d., latest
No. 2 Norton Universal Hydraulic, m.d., latest
No. 13 Brown & Sharpe, m.d., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Oliver Drill Pointer, m.d.

MANUFACTURING LATHES

No. 4 LeBlond Boring Lathe, 32" bed, 18" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½"x36", 3½x80", 4x60", 8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
13"x23" LeBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13"x36" LeBlond Rapid Production Tirken, latest
13"x48" Coulter Automatic Threading, m.d.
16"x6' LeBlond Rapid Production, m.d.
16"x6' Lodge & Shipley Simplified Mfg., cone, motorized
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Rapid Production, m.d.
17"x8' LeBlond Automtaic Mfg., m.d.
20"x8' LeBlond Mfg., m.d.
21"x8' LeBlond Turret Lathe, cone
Niles-Bement-Pond Quartering Machine, m.d., new
Schauer Type NA 2B Speed Lathe, m.d.

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Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 12"x36", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—16"x6', 8', 10'—18"x6', 8', 10'—20"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
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Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24" H.D. crank.

Turret Lathes—J & L 2"x21"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 3 hole turrets, 20", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 2¾" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

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Drill—Foote-Burt No. 25 21" Hi Duty 2" capacity in steel. Motor attached.

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All Late Type

Bullard Multaumatics, 16", 12", 8", late
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#28/60 Vertical Cincinnati Hydrotel, '44
2300 ton Bliss Hydraulic Press, sacrifice, late!
#2, #3 Cinci. Dial type, Univ. Mills
6'17" Column American Hole Wizard Radial Drill, AC Motor on Arm
5" Fisher Horiz. Floor Type Boring Mill, Late
5" Bar Table type boring mill, Giddings & Lewis #350T
#12 Brown & Sharpe Production Mills, 48½" x12" table size, $2250.00 ea.
#18 Blanchard Surf. Grinders 36" chuck, late type.
9, 16", 1", 1¼", 1⅝", 2¼", 2⅝" RA6 Acme Gridley Auto.

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INDUSTRIAL CHILLING MACHINE
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4" Univ. Table Mill, 60" vert. 96" hor., '43
36" & 42" King Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 9J Gorton Duppiicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
No. 6 M. & M. Keyseater, AC, M.D.
30"x20' cen. Axelson Lathe, T. A.
30"x120" Hanchett Piano Surface Grinder

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DETRICK & HARVEY 60" x 60" x 18' openside planer, with two rail heads and one side head. Serial No. 827.
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GIDDINGS & LEWIS #45, 5" bar, Latest Type
HEALD 48, 49 single end, Horomatic, Latest
LANDIS—#35—3¼" bar, floor type, M.D.
LUCAS #41, 3" bar, Table Type, Latest Type
LUCAS #42, 5" bar, Table Type, Late Type
NILES BEMENT-POND 5", 5" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical
BULLARD 16" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 12" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 24", 36" Turret "New Era" Side Head, M.D.
BULLARD 24", 36", 42" Vert. Turret "Spiral Drive" High Speed, Latest Type
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KING 62", 2 swivel heads, Rapid Traverse, M.D.
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.

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CINCINNATI Series 300, ⅛"x8'6", Motor Drive
VERSON #206, 10 gauge x 96", Latest Type

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AMERICAN V-2, 6 ton Hyd., Latest Type
CINCINNATI 1-36, 3-30, Duplex Vertical Surface, Hyd., Double Ram, Model ER, Latest Type
LaFOUNTE 3-36 Vertical, Hyd., Latest Type

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BARNES H-3 "Hydram," Hydraulic, 3" capacity—for inverted drilling, Latest Type
CINCINNATI BICKFORD 24" Box Column, Latest
LELAND & GIFFORD #1LMS, 4 Spindle, Latest Type
LELAND & GIFFORD #2, #2MS, Single Spdle.
LELAND & GIFFORD #2LMS 3 and 6 spindle, Latest

DRILLS—Deep Hole
BARNES 420/2 Spindle Hydraulic, Latest Type
LeBLOND #2 Single Spindle, Hydraulic, Latest Type
PRATT & WHITNEY #1Bx50", Hyd., Latest Type

DRILLS—Multiple Spindle
NATCO #1AL, 20 Spindles, Hyd., Latest Type
NATCO D-5, 9 adjustable spindles, Motor Drive

DRILLS—Radial
AMERICAN 4' arm 11" col. "Hole Wizard," Latest
AMERICAN 4' plain Triple Purpose, Motor Drive
AMERICAN 5' arm 13" column Plain, M.D.
CINCINNATI BICKFORD 5'13" Column, Plain, M.D.
CIN. BICKFORD 6' arm 15 col. Plain or Univ., M.D.
DRESES 5' arm 15" column Univ., M.D.
WESTERN 6' arm 20" column Plain, Latest Type

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BARBER COLMAN #12 Hobber, Single and Double Geararn, Motor Drive
BROWN & SHARPE 6-60 Gear Cutter, Motor Drive
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
CROSS #30 Universal Gear Chamferer, Latest Type
CROSS #1 Tooth Rounder, Motor Drive
FELLOWS 6L, 61A, 65A3, 6Z2, Model Z, 7A, 7, 72, 725, 77 High Speed Gear Shaper, Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #12L8 Lapper, latest type
FELLOWS 8M Red Liner, Latest Type
GLEASON #14 Hypoid Spiral Generator, Latest Type
GLEASON 9", 12" straight bevel generator, latest type
GLEASON #4, #6, #18 Bevel and Hypoid Tester
GLEASON 24", 37", 77", 96" Bevel and Spur Gear Planers, Motor Drive
GOULD & EBERHARDT 12H Hobber, Latest Type
GOULD & EBERHARDT 98H Hobber, with diff. M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 6"x18" Type C Plain, Hyd., Latest Type
NORTON 6"x18", 14"x36", 24"x72" Type C, Plain, Latest

GRINDERS—Miscellaneous
BARBER COLMAN #3, #4 Hob Sharpener, Latest
BROWN & SHARPE No. 13 Univ. Cutter & Tool, Lat.
BRYANT #16-CP-16, #24—36", Internal, Hyd., Latest
CINCINNATI #2, #3 Centerless "Filmatic," Latest
CINCINNATI "Monoset" Tool & Cutter, Latest Type
GARDNER 24-55" Disc Grinder, Latest Type
FITCHBURG 14"x23" Spline, hydraulic, latest type
GLEASON #12 tool sharpener, Latest Type
HEALD 72A3, 72A5 "Gagematic," Internal, Latest
HEALD 75A, 72A3, 72A5, 74 Internal, latest
JONES & LAMSON 6x18, 8x18 Auto Thread, latest
LANDIS #6, 6x24 Thread, latest type

PRATT & WHITNEY 6"x60" Centers, Model C, Thread Milling Machine—4-1/32" hole through spindle, Latest Type

LANDIS #6, 6x24 Thread, latest type
LANDIS #12 Centerless, Hydraulic, Latest Type
THOMPSON 6"x18" Auto., rd. broach, MD

GRINDERS—Surface
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD 16A Vert., Dial Feed, MD
DO-ALL Model G-7, 9"x20", Hyd. Latest
HANCHETT Series 399 12"x18" Vert. Hyd., Latest
HANCHETT #36, Vert., 36" dia. mag. chuck, latest
HANCHETT #120, 30x120" Plano, Hyd., Horiz., Latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16" and 30" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type
THOMPSON 12x12x24 Type D Hyd., Latest

JIG BORERS
KEARNEY & TRECKER Model B, Auto., Latest
PRATT & WHITNEY 1A, Motor Drive

LATHES—Engine and Mfg.
AMERICAN 26"x36" cent., 3 carr., M.D.
BRIDGEFORD 36"x32' bed—2 carriages, M.D.
HENDEY 12x30", 14x30", Timken, Latest Type
JONES & LAMSON "Fay" 20x25", 24x24 auto., latest
LeBLOND 21"x60" Centers, Geared, Motor Drive
LEHMANN 16x30" centers, TIMKEN, latest type
LODGE & SHIPLEY 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 18x72 centers, Motor Drive
LOSWING 4x60, 4x84, 8x60, 8x108, 8x84, Latest
MONARCH 10"x20" centers, Model EE, Timken, latest
MONARCH 12"x30" Centers, Model CK, Timken, latest
MONARCH 12"x24" Centers Model CW, Latest
MONARCH 16"x48" Centers, Model CW, Latest
MONARCH 22"x456" Centers, 2 Carriages, Timken Bearing, Model CM, Motor Drive
MONARCH 24"x24" Ball Bearing, Geared Head, M.D.
NILES 36"x50' Boring "Time Saver" Timken, Latest
NILES 60"x55' Centers, Heavy Duty "Timesaver," 2 carriages, Rapid Traverse, Latest Type
PRATT & WHITNEY 16"x30" Centers, Timken, Latest
PRATT & WHITNEY 10"x20" centers, Bench, latest
PUTNAM 42"x25' Centers, Motor Drive
REED PRENTICE 20"x54" Centers, Model A, Latest
SPRINGFIELD 16"x30" centers, Timken, latest type
WARD, HAGGAS & SMITH—18/30x96" centers gap, motor drive, Latest Type

LATHES—Hob and Cutter Relieving
MICHIGAN 1712 Universal, Latest Type
U. S. TOOL #810B, Latest Type

LATHES—Turret
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
FOSTER #4FU "Fastermatic," Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Timken, Latest
GISHOLT #3, #4, univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5, Univ., Timken, Latest
LIBBY "International" 1H5 Univ., Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON #2DE, Timken, Latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #2, #3, Timken, Latest Type
WARNER & SWASEY #1A, Univ., Timken, M.D.
WARNER & SWASEY 2 Universal, Timken Bearing, "Pre-selector," Bar and Chucking, Latest Type
WARNER & SWASEY 3A Universal, Timken Bearing, Bar and Chucking, Latest Type
WARNER & SWASEY 4A Universal, Timken Bearing, Bar and Chucking, New 1947

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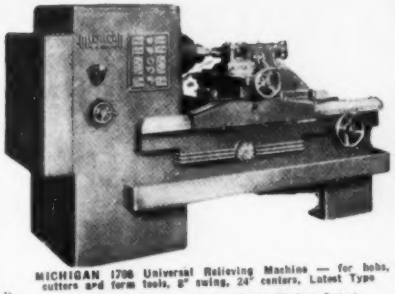
HALL Style L, Planetary, latest type
INGERSOLL 42"x36"x12" rad. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 30x24x12' adj. rail slab, M.D.
SUNDSTRAND Model 7A Duplex 42" feed, Latest
TAYLOR & FENN 4480 Duplex Spline, latest

MILLING MACHINES—Plain
BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #13, 24" feed, Latest Type
BROWN & SHARPE #00G, Timken, Latest Type
BROWN & SHARPE #2B, 3B, Timken, Latest Type
CINCINNATI 0-8, 1-12, 2-18, Automatic, Latest Type
CINCINNATI #3, #5, High Power, Latest Type
CINCINNATI 2-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER 121S, 140A, Simplex, Latest
KEARNEY & TRECKER #5G, #4, Timken, Latest Type
KEARNEY & TRECKER 4K, Timken Bearing, Latest Type.

MILLING MACHINES—Thread
LEES BRANDER 12"x54" Centers, Latest
MOREY 12x30", 60", 120", 190" centers, Latest
PRATT & WHITNEY 6"x60" centers, Model C, Latest

MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, Timken Bearing, Latest
BROWN & SHARPE No. 3A, 4A, M.D.
KEARNEY & TRECKER 2H, Timken, Latest Type
KEMPSMITH #4 Maxi-miller, Timken, latest type
VAN NORMAN #3 duplex, Motor Drive
VAN NORMAN #12, #36, #36, Timken, Latest Type

MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest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CINCINNATI #2, #4 Dial Type, Timken, Latest
CINCINNATI #08, TIMKEN, Latest Type
GORTON 8D, 8½D, Super-Speed, Latest Type
KEARNEY & TRECKER 2K, 3H, Timken, Latest Type
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VO, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type

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CINCINNATI 30"x30"x8', 4 heads, PRT, DC, M.D.
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NILES 30"x84"x42' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 42"x12"x14' "Time Saver," Box Table, 3 Heads, PRT, VARI VOLAGE Drive, Latest
NILES 48"x48"x14', 4 Heads, PRT, Box Table, M.D.

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BIRDSBORO 325 ton, vert. hyd., Latest Type
BLISS 75-35 Hydro-Dynamic, Double Action, Latest
GLEASON 3½" Quenching, H.L., Motor Drive
HENRY & WRIGHT 50 ton Dieing, Roll Feeds, M.D.
LAKE ERIE 500 ton Vert., Hyd., Latest Type
NILES 400 ton, Horiz. wheel, Motor Drive
UNITED ENG. 500 ton, Vert., Hyd., Latest

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CLEVELAND 9/16", 1 1/16" Model A, Latest Type
CONOMATIC 2¾"—4 spindle, Latest Type
GOSS & DeLEEUW 2"x8¾", 6 spindle Chucker, Tool rotating, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

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DILL 20"-24" Vertical, Motor Drive
GOULD & EBERHARDT 20", 32", High Duty, M.D.
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SMITH & MILLS 16" high speed, latest type

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QUICKWORK #6, 1" Cap., Rotary Shear, M.D.

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CAMPBELL #401 Abrasive Saw, Latest Type
DE LAVAL #194 Coolant Clarifier, Latest
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MANVILLE 20 7/16" Cap. SSSD, Ball Header, M.D.
NAZEL #4B Pneumatic Hammer, M.D.
NORTON #2F 10U Vertical Lapper, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416, Type G, Copying, 2 and 3 dimensional, Latest Type
PRATT & WHITNEY ½B, 50 Rifler, Latest Type
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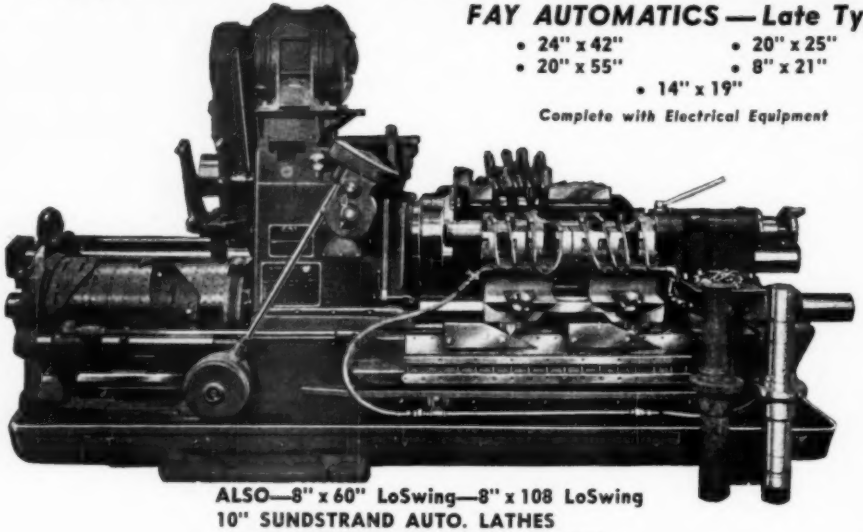
Complete with Electrical Equipment



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6" SUNDSTRAND BRAKE DRUM LATHE

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PRICE: $.65 each any size

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5/16"x5/16"x2 1/4"
3/8"x3/8"x2 1/2"
7/16"x7/16"x3"
1/2"x1/2"x3 1/2"
5/8"x5/8"x4"
3/4"x3/4"x4 1/2"

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20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Do-All 8 x 24" Horiz. Sp. Hydr. Surface Grinder
Blanchard M.D. Vert. Sp. Surface Grinder 26" chuck
L. & S. 20" x 8', 18" x 12', 20" x 10', 25" x 12'
Axelson 29" x 12', Hendey 14" x 6', Amer. 17" x 8'
Monarch 28" x 8', Amer. 28" x 12' grd. bd. q.c.c. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin. No. 3, Mil. No. 2-B & 3-B, Cin. No. 5, LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mil. No. 2-B, Cin. No. 1-M, Cin. No. 2, Grd. Hd. Univ. Millers
Cin. 36" M.D. Univ. Shaper, G & E & Amer. 24" Shapers
Cleveland 48" x 12" Table Open-side Planer, 3 Hds.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

National Bent Shank Nut Tappers Battery of 5/8" to 1" Machines.
Waterbury-Farrel Fdry. 5/8" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

DEEP HOLE DRILL

Baush Horizontal Deep Hole Drill, rifle Barreling machine, with two motors, and two 3 jaw chucks, double end. *Late Type*

PRICE — $1,500.00

WINSTON MACHINERY CO., INC.
517 South Delaware St.
Indianapolis 4, Ind.

16"x54" Monarch 16-speed Timkenized Lathe
13"x30" Pratt & Whitney Model "B" Lathes
36"x25 ft. Niles-Bement-Pond Lathe
3" UNIVERSAL "Tri-Way" Horizontal Boring Mill
#33 Lucas Horizontal Boring Mill 4½"
10"x48" Norton "C" Plain Grinder
#3MS Cincinnati Dial Type Plain Miller

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

CHOICE TOOLS

20"x96" NORTON Plain Cylindrical Grinder, AC-MD
20"x96" cc AMERICAN 12 Speed Timken Spindle Lathe, taper, rapid traverse, AC-MD
30"x144" cc NILES Timesaver Lathe, 1941
36"x25' cc NILES Heavy Duty Lathe, 2 carriages, 1941
48"x20' cc BETTS BRIDGEFORD Heavy Duty Lathe, 1941

O'CONNELL MACHINERY CO.
1625 NIAGARA ST BUFFALO 7, N.Y.

DRILLING MACHINE
Model H-3

Barnes HYD-RAM. Extra High Column Machine, provided with hydraulic dwell. 8 Speeds.

TOLEDO MACHINERY MART
6225 Benore Rd., Toledo, Ohio

LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1941.
1½" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme-Gridley. 1942.
No. 60 New Britain, 1" cap. 1943.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3' 9" Morris "Mor-Speed". Latest.
25" Fosdick "Economax". 1941.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

GEAR EQUIPMENT
3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 615A & 61A Fellows Shapers. 1943.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
12"x16"x60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.
No. 2-1 Reid, 6"x18" cap. 1940.

LATHES, ENGINE
45"x192" Axelson. 1942.
28"x276" Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic." 1940.
No. 3A L&S "Duomatic." 1943.
No. 2FU Foster "Fastermatic." 1943.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic." 1941.
20"x25" Fay Automatic. 1942.

LATHES, TURRET
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½"x24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4 Cincinnati Dial Type. 1942.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
8L-2420 P&W "Keller" 3 sp. 1942.
8L-2416 P&W "Keller", 1 sp. 1943.
8G-1 Keller, single spdl.
No. 1-14 & 2-20 Kent Owens. 1942.
No. 1248 Kearney & Trecker. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
4"x9" Hanson Whitney. Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

PRESSES
No. 40-5 ½ Minster. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison, Hyd. Str. 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

A PARTIAL LIST OF LATE MODELS

AUTOMATICS
Brown & Sharpe #00G, H.B., #4, #6
Conomatic 8 sp. 1⅝" cap.
New Britain Gridley 6I—6 Sp. 2¼"

BORING MILLS
Giddings & Lewis #8, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #31 horiz.

DRILLS AND RADIALS
Cassedy-Otte 3'-9" col.
Carlton 8'-10" col., Foote-Burt 6 Sp.
Cincl-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24—28", Allen 6 Sp., Excelsior 21"

ENGRAVERS
Gorton #3U, 3Z, 3L; Deckel GI.
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT
Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardener

GRINDERS—Miscellaneous
Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x30", 12"x48"
Covel #9IA Utv. Tool & Cutter
Gardner #22B, 30" diss. Heald #1 Tool
Heald #72A3 Int. Sizematic
K. O. Lee Tool & Cutter
Landis #4H Cyl. 4"x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WGS
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Gramby Int.

GRINDERS—Surface
Abrasive #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" chuck, #11—16" chuck
Brown & Sharpe #2
G. & L. #2S, #3S Hyd., 6x18" & 8x24"
Hanchett #300, 13x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x40" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES
Bradford 16"x8', Hardinge Precision 9", cabinet
Handey G. H. 16x30 with relieving att.
LeBlond Regal 10"x31½", 15x30", 19x40", 21x60"
Ledge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Monarch Model CKK 12x30" Dbl. Compound
Rivett Precision, Logan 18"x30"
South Bend 9"x3', 9"x3½', 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

LATHES—Turret
Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 4 Bar & Chuck—2L Saddle type
Hardinge 6SM, 2nd operation
Jones & Lamson #8A Univ., Saddle, Threading
Oster #60I Rapiduction
Warner & Swasey #3, #4, #4A—6" Bar Cap.

MILLS—Plain & Universal
Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2M H Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, Univ.
Van Norman #12, 20, 22L, 36 Kempsmith 2G

MILLS—Vertical—JIG BORERS
Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4, Jackson
Gorton #3D, 9J Plain, #9½D Duplicator
Kearney & Trecker #5H, 3H High Speed O.T.
P&W 1½B Jig Borer, 9in Jig Borer #MP-S
Moore Jig Grinder, Vernon jig borer
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production
Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES
Bliss #8 Dbl. Crank, Bed 42x96", 250 Ton
Bliss #675, 645B, 650 Hi-Production, 304A, 305A S.S. Geared
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 OB. Gap Frame #62, 62A, 162
Ferracute Notching #C62
General Flexible Electric Screw Press
Henry & Wright 25, 75 Ton Dieing
Reliance #45 O.B.I.
V. & O. #102 Reducing
Zeh and Hanneman 30 Ton & #7 Percussion

MISCELLANEOUS
BAND SAW: DoAll V16, Tannewitz #36M, 36" Marvel #8
BENDING ROLL: Buffalo #8, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6, #4B
HONER: Micromatic #H-1 Hydrohoner, Sunnen
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneumatic
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 32" G. & E. Universal
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
VERTICAL SHAPER: 6" Pratt & Whitney
WELDERS SPOT & SEAM: Taylor Winfield, Elsler 50 KVA, Thompson
WRAPPING ROLL: Buffalo #1½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen Stroke	Opening
500 Ton	Lake Erie	35x30"	30" 60"
600	Bald. B'ldw'k	70x50	22" 36"
500 D.A.	H.P.M.	36x30"	24" 36"
1000	French Oil	53x42"	20" 50"
350	Verson	40x40"	36" 72"
50	Dennison	22x20"	18" 23"
150	Southwark	34x30"	30 2" to 4'

UP MOVING RAM PRESSES
3000 Ton Tryout and Hobbing
300 Ton Watson-Stillman Hobbing, NEW.
600 Ton Birdsboro 42x32 platen—20" stroke
900 Ton Birdsboro 40x32 platen—20" stroke
800 Ton Birdsboro 40x32 platen—20" stroke
600 Ton Southwark 34x23 platen—20" stroke
100 Ton Stokes self contained Molding
300 Ton Dunning and Boschart Molding Press
300 Ton Watson-Stillman 24x20 platen—8" stroke
500 Ton Self contained Shaft Straightener.
350—500—600 Ton Wheel Presses

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MONA MEMBER

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

BORING MILLS

Bullard 24" Vert., Spiral Drive
Bullard 36", Vert., New Era Type Head
Bullard Maxi-Mill 54", 2 hds. on rail, Vert.
Lucas 3" bar, #1, Horiz.
Cincinnati Gilbert 2½" spindle, Latest Type
Heald #48, Single End Borematic
Heald #47 A, Boring Machine
P & H Horiz., 4" bar
Defiance #23 A Boring—Drilling, 3¼" bar
Defiance #6, 4½" bar

LATHES

American 14"x6', 3 spd, SCEL
American 16x78" Pacemaker, 27 spoeds, MD
American 16"x6', 4 spd, hg, SCEL
American 16"x6', Collman Drive
American 16"x8', 3 spd, dbg, SCEL
American 18"x6', Geared Head
American 18"x8', 3 spd, Bowl Head, BG
American 24"x10', SPD, GH, SCEL
American 24"x12', 8 speed, GH, SCEL
American 24"x14', 8 speed, GH

AMERICAN 30"x15' GH, 12 SPEED, SCEL, M.D.
AMERICAN 30"x25' GH, 12 SPEED, SCEL, M.D.
AMERICAN 42"x14' BED INTERNAL FACE PLATE DRIVE GH ENGINE LATHE, M.D.

Boye & Emmes 10"x8', 4 spd, dbg, SCEL
Boye & Emmes 10"x8', 3 spd, dbg, SCEL
Boye & Emmes 18"x8', 3 spd, Lima Drive
Boye & Emmes 18"x10', M.D., SCEL
Hendy 14"x6', 3 spd, qc, SCEL
Hendy 14"x6', 4 spd, Drive all Drive
Hendy 14"x6', Model EBM, Motor driven
Hendy 16"x6', 4 spd, sbg, SCEL
Hendy 18"x8', 4 spd, SCEL
LeBlond 17"x5', spd, 12 speeds, gh
LeBlond 17"x8', 3 spd, dbg
LeBlond 21"x8', 3 spd, dbg, SCEL
LeBlond 24"x10', 3 spd, SCEL

LEBLOND 25"x12' H.D., QC, SCEL, M.D.

LODGE & SHIPLEY 14"x30" CENTERS, SELECTIVE G.H., M.D.

Lodge & Shipley 14"x5', 3 spd, bg, SCEL
Lodge & Shipley 14"x6', 3 spd, dbg, SCEL
Lodge & Shipley 16"x8', Selective G.H.
Lodge & Shipley 18"x8', spd, SCEL

Lodge & Shipley 18"x8', 3 spd, dbg, SCEL
Lodge & Shipley 18"x8', 3 spd, dbg, SCEL

LODGE & SHIPLEY 29"x8' GH, SCEL, M.D.

Lodge & Shipley 29"x10', 5 spd, SCEL
Lodge & Shipley 24"x10', 3 spd, dbg, Turner Uni Drive
Monarch 14"x6', 3 spd, dbg
Monarch 18"x8', 8 speeds, SCEL

NILES TIMESAVER 30"x10' CENTERS, DOUBLE WALL APRON

Sebastian 18"x8', 4 spd, SCEL
Sebastian 29"x8', GH, SCEL
Schoumaker & Baye 36"x24', Internal Face Plate Drive
Springfield 18"x8', 4 spd, SCEL

GEAR CUTTERS

Brown & Sharpe #3—30" Automatic, SPD
Gould & Eberhardt 18H, spd, MD
Gould & Eberhardt 36S, Vert. cutter
Brown & Sharpe #3—20", M.D.
Fellows #6I5, Helical
Gleason 6" straight Bevel, MD
Gleason 15" Spiral bevel gear Generator

GRINDERS, ALL TYPES

Cincinnati #2 Centerless
Cincinnati #3 Centerless
Brown & Sharpe #13 Univ. & Tool Grinder
Covel #91A Univ. Cutter & Tool Grinder
Gardner #129A Opposed Wheel Grinding Machine
Sellers #4T Tool Grinder
Landis 4"x12" Type H Plain Cylindrical Grinder
Landis 12"x72" Plain Self Contained Grinder
Norton 14"x96" Type BA Plain Grinder
Landis 20"x220" centers, Plain Cylindrical Grinder
Landis 10"x72", Plain Self Contained
Brown & Sharpe #12 Plain Grinder
Norton 14"x36" Univ. Grinder
Landis 10"x24" Type "C" Hyd. Univ. Grinder

GRINDERS

ExCello #35L Precision Thread Grinder
Gallmeyer & Livingston #4, Univ. Tool Grinder
Van Norman Model 606, Crank Shaft Grinder, 20x48

TURRET LATHES

WARNER & SWASEY #3, WITH PRESE-LECTOR

Warner & Swasey #2, Ram type

MISCELLANEOUS

Cincinnati #3 Dial Type Medium Speed, Plain, Miller
Cincinnati #3 High Speed Dial Type, Plain, Miller
Rockford 16" Hydraulic Shaper, Late Type
Cincinnati Bickford 21" Upright Drill Press

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Cincinnati 2, Ohio

CRANE: Milwaukee 30 Ton 95' Span (New) with 15 ton Aux. Hoist.

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Z & H #7, 50 ton, Percussion
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Clearing, 200 ton, Late
Bliss #310, 450 ton

Lake Erie, 750 ton, Hydraulic Bed 72"x146", single or double action, late (will draw 22")

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11"x¾" Initial
10"x¾" Roll leveller
BRAKES: PRESS
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Cinci. 10'x⅜" (1935)
Ohi 10'x⅜" (old)
PLATE EDGE PLANER:
H & J 32"x2"
PLANER:
N B P 48"x48"x26', 4 heads
MILLER—PLAIN HORIZ.
R & T #4K (late)

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AUTOMATICS

½", No. 0G Brown & Sharpe
⅝" Acme Gridley model R6
⅞" & 1¼" Cone 4 spindle
1¼" Cleveland 4 spindle
1⅝" Greenlee 6 spindle
1⅝" New Britain 6 spindle
1⅞" Conomatic 8 spindle
2"x18" Cleveland model B
2⅜" Acme Gridley model RA6
3" Bullard Multaumatic
No. 2 FU Foster Fastermatic
No. 16 New Britain 6 spdl. chucker
14"x18" Fay chucker

BROACHES

No. 1 Foote Burt duplex surface
2 ton American horiz. hydraulic
No. 3 Oilgear horiz. hydraulic
No. 10-72 Colonial horiz. hydraulic
No. 3 Lapointe screw type
10"x72" Colonial broach sharpener

DRILLS, MULTIPLE

72 spdl. Baush two way
42 spdl. No. B 18 Natco
24 spdl. No. 30 Natco
24 spdl. No. B4A Natco
22 spdl. No. 14 Natco
16 spdl. No. 2 BL Natco
12 spdl. No. 39 Natco rail
12 spdl. No. 25 Baush rail
8 spdl. No. 11 Natco

GRINDERS

No. 72A3 Heald Sizematic internal
No. 72A3 Heald Sizematic centerless
Nos. 72A3, 72A5 & 74 Heald plain
No. 75A Heald hand feed
Nos. 16A16, 16-28, 16-36, 16CP16 & 24-36 Bryant
Model MHI Sav-way hydraulic
Size IC Gremby internal
No. 2 Cincinnati centerless
No. 10 Blanchard surface
Nos. 3 & 34 Abrasive surface
8"x24" Wilmarth Mormon surf.
12" & 16", No. 22 Heald rotary surf.
16" & 24" No. 33A Heald rotary surf.
24"x48" Springfield surface
No. 2 Norton universal tool
Model 4T Sellers tool
No. R6 Pratt & Whitney tool
No. 51 & 510 Oliver drill
No. 10G Sellers drill
Nos. 33 & 35 Excello thread

LATHES, TURRET

Model 6.2 Denver
Nos. 2 & 3 G Morey
No. 4 Midland
Nos. 5 & 7 Bardons & Oliver
No. 3 Jones & Lamson
No. 5 Foster
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 3, 4, 5, 3AL & 28" Gisholt
24" & 36" Bullard vertical
No. 2 FU Foster Fastermatic
3"x36" & 4"x34" Jones & Lamson

MILLERS

No. 2H Kearney & Trecker univ.
No. 3 Cincinnati universal
Nos. 2AS & 3B Milwaukee plain
Nos. 2, 3 & 4 Cincinnati vertical
Nos. 2H & 3H Kearney Trecker vert.
No. 3V Van Norman vertical
No. 3 Kempsmith Maximill vert.
Nos. 1-12, 1-18, 2-18 & 2-24 Cint. auto
Nos. 0-8 & 2-10 Cint. Rise & Fall
Nos. 3-24, 34-36, 4-36, 4-48, 5-48, 56-72 and 56-90 Cincinnati Hydromatic
Nos. 1H-12", M18, M24 & 12-24 Kearney & Trecker
30", 42" & 84" Ingersoll Rotary

PRESSES

1000 ton Southwark hydraulic
1000 ton No. 666 Toledo coining
600 ton No. 2316½ Hamilton forging
350 ton No. F1350-42 clearing
48", No. 93½ Toledo double crank
Nos. P1, P2, P3, P4, P5, PG5 Ferracute
No. 6 American Can OBI

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SAGINAW, MICH.

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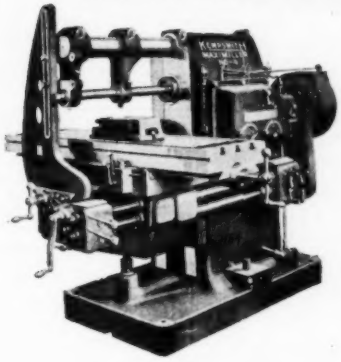

No. 3 Kempsmith "MAXIMILLER" Plain, with motor in base. Power rapid traverse. Table work surface 14"x58". Longitudinal feed 34", transverse feed 12", vertical 19". Eighteen spindle speeds, range 16 to 400 RPM. Eighteen feeds, range IPM .625" to 25". Overarm diameter 6". Pump, piping, arbor supports and brace. Inspect at Albany.

No. 5 Kempsmith "MAXIMILLER" Plain, with motor in base. Power rapid traverse. Table work surface 18" x 84". Longitudinal feed 52", transverse feed 16", vertical 19". Spindle nose No. 50 American Standard. Eighteen spindle speeds, range 14 to 355 RPM. Eighteen feeds, range IPM 5/8" to 25". Overarm diameter 8". Pump, piping, arbor supports and brace. Inspect at Albany.

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4—NEW BRITAIN No. 60, 6-spindle
2—ACME GRIDLEY 2" Model RAS 6-spindle
1—CONOMATIC 3½", 6-spindle
3—CONOMATIC 2⅝", 6-spindle
2—CONOMATIC 1¾", 8-spindle

Grinders:

2—VAN NORMAN ⌀673 Radius Internal
16—VAN NORMAN ⌀620 Radius Internal
12—VAN NORMAN ⌀630 Radius External
7—CINCINNATI No. 2 Centerless "Filmatic"
3—EXCELLO No. 33 Thread
31—HEALD No. 81 Internal Centerless, Gagematic-Sizematic

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HEADLINERS

LATHES

16"x10' American 12-speed Grd. Hd., AC MIB taper
18"x10' American Grd. Hd., AC MD
18"x12' Lodge & Shipley Selec. Grd. Hd., AC MD
20"x8' Lodge & Shipley Selec. Grd. Hd., AC MIB taper
22"x10' Rockford 3 SCD DBG bowl hd.
24"x10' American Grd. Hd., AC MD
24"x12' American Grd. Hd., AC MD taper
24"x14' Lodge & Shipley, Turner Drive, taper
24"x18' American Grd. Hd., AC MD taper
30"x16' Lodge & Shipley, Lima Drive, taper

MILLERS

#2 Cincinnati High Speed Dial Type Univ., div. hds., new 1943
#3 Cincinnati Med. Speed Dial Type Plain, new 1943
#2 Cincinnati H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#2—B Milwaukee DOA Plain, AC MD
#2—M Cincinnati Rect. O/A Plain, AC MIB, #50 spindle, Timken
#3 Van Norman Duplex, AC MD
Type "P" Ohio Production, heavy, new 1943
#4 Cincinnati H.P. Univ., Lima Drive, div. hd., slot. attach.

SHAPERS

20", 24", 28", 32" Gould & Eberhardt
28" AMERICAN Hvy. Duty, AC MD
28" Cincinnati Heavy Duty, AC MD, PRT, new 1943

PLANERS

22"x22"x6' Cincinnati, 1 hd.
28"x28"x6' Cincinnati, 1 hd., box table, AC MD
30"x30"x18' Whitcomb, AC MD, 2 hds.
36"x36"x18' Gray Extra Hvy. Pat., 2 hds.

DRILLS (UPRIGHT & RADIAL)

4' Morris Enclosed Head, AC MD
7' Dreses, AC MD
28" Cincinnati "Super Service" Box Col., new 1941

GRINDERS

#3 Abrasive Surface, AC MD
#5 Abrasive 14"x48" Surface, AC MD
#22 Heald Rotary Surface, new 1943
10"x24" Landis Type C Univ. Hydr., new 1943
10" and 14" Hammond Carbide Tool, AC MD., wet type, late
#2 Cincinnati Tool & Cutter, AC MD, late type

BORING MILLS

36" Bullard "New Era" V.T.L.
#3A Universal Horz. 8" bar, SPD

GEAR MACHINERY

#6—72" Brown & Sharpe Gear Cutter, AC MD
#12H Gould & Eberhardt Hobber, AC MD
#18H Gould & Eberhardt Hobber, AC MD
#34 Brown & Sharpe Hobber, AC MD
32" dia. x 16" face Cincinnati Hobber, 8" dia. hole AC MD
#12 Barber-Colman Spline Hobber, 3⅛" hole, DOA, AC MD

MISCELLANEOUS

R-4-P Wiedemann Power Turret Punch, gauge 10'x1/8" Ohl Shear, AC MD
#1 Ryerson 46" Friction Saw, 25 HP AC MD
16"x21" Fay Automatic Lathe, new 1943
#1A Warner & Swasey Univ. Turret, AC

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Cinn. #2M Rect. Over.—motor-in-base—Univ., —wkg. tbl. 49"x10½" range 28"x10"x19"—rpd. trav.

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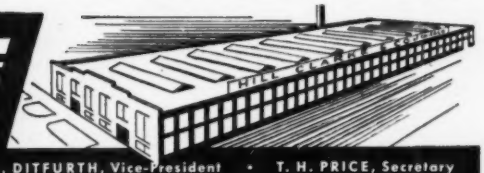

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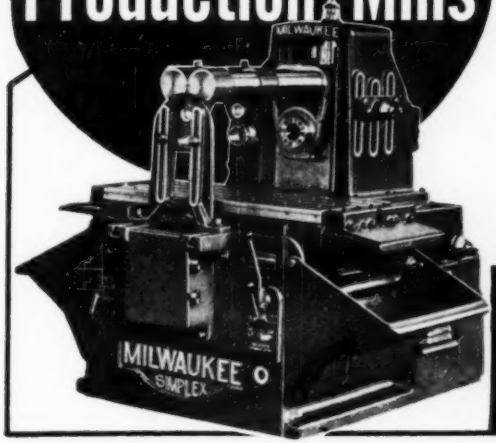

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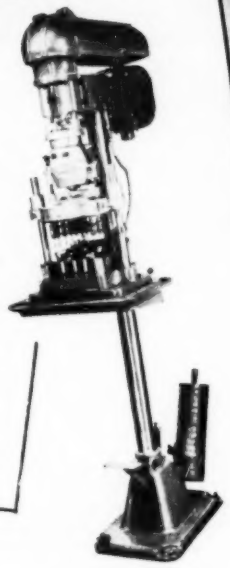

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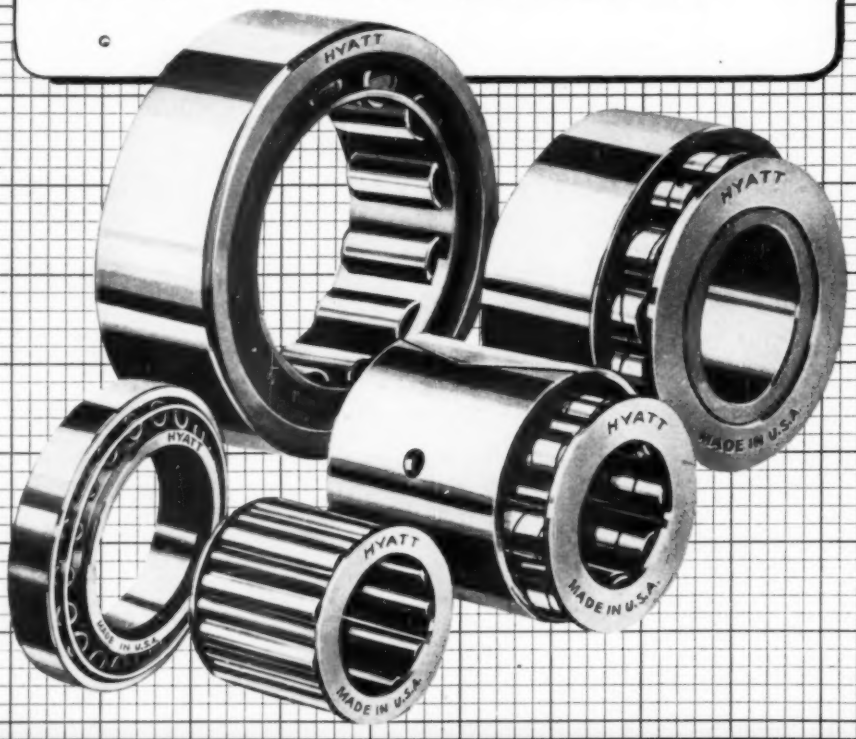

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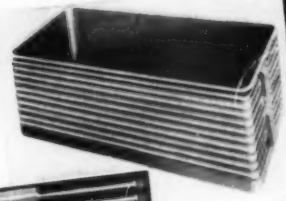
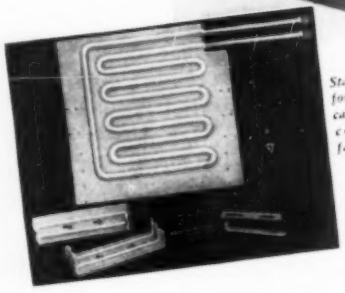
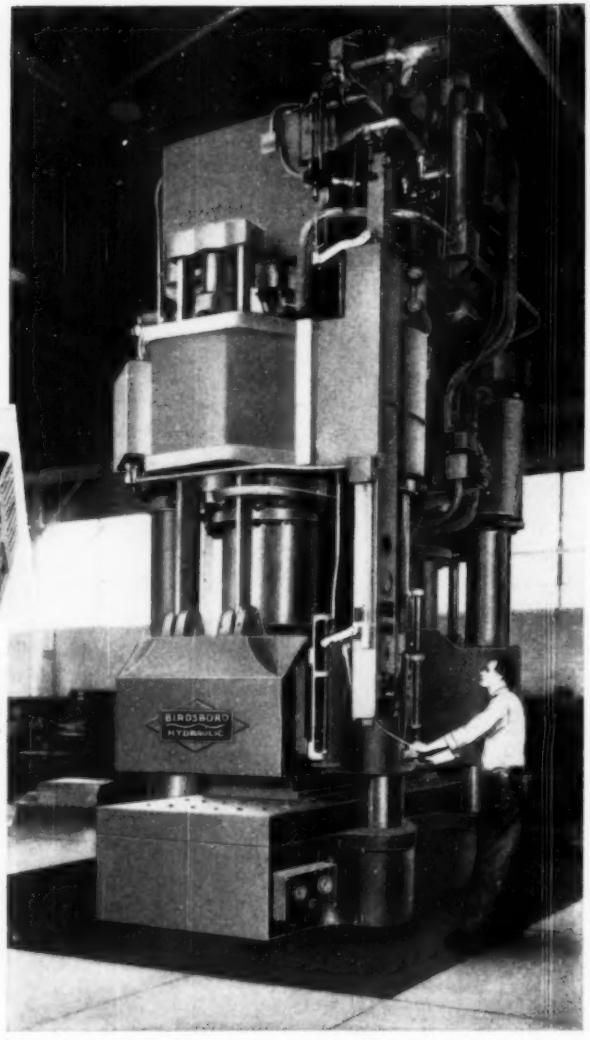


Conversion Plates for ice cream cabinets and fountains.



Standard liners for frozen food cabinets, milk coolers and farm freezers.



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